

NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



THESIS

**PREVENTING BALLISTIC MISSILE PROLIFERATION:
LESSONS FROM IRAQ**

by

Brian J. Talay

December, 1996

Thesis Advisor:

Peter R. Lavoy

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LESSONS FROM IRAQ**

Brian J. Talay

Lieutenant, United States Navy

B.A., University of California, Santa Barbara, 1989

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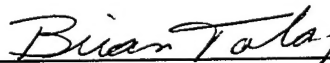
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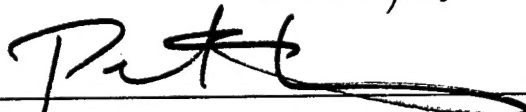
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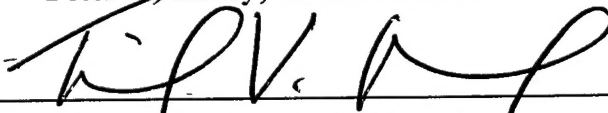


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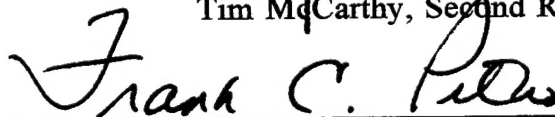
Approved by:



Peter R. Lavoy, Thesis Advisor



Tim McCarthy, Second Reader



Frank C. Petho, Acting Chairman

Department of National Security Affairs

ABSTRACT

The proliferation of weapons of mass destruction and ballistic missiles is now one of the greatest threats to the United States and its allies. Efforts to contain WMD proliferation, particularly the Missile Technology Control Regime (MTCR), have had limited success and must be improved to deal with new arms proliferation challenges.

This thesis examines the case of Iraq to assess the performance of the missile nonproliferation regime since 1970. By providing a detailed analysis of the methods used by Iraq to obtain missile systems and missile technology, this thesis assesses the ability of the international community to prevent ballistic missile proliferation. Understanding Iraq's past capabilities as well as its post-war efforts to rebuild weapons programs and procurement networks, this thesis provides suggestions for improving the regime's performance.

This thesis finds that (1) prior to 1992 the MTCR failed in its attempts to prevent proliferation; (2) the existence of the MTCR, while necessary to slow proliferation, is not sufficient to prevent proliferation; and (3) additional enforcement is needed to counter WMD acquisition by resourceful and determined states.

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EXECUTIVE SUMMARY

The quest for nuclear, biological and chemical (NBC) weapons and the missiles to deliver them creates serious challenges to U.S. interests around the world. Proliferation trends indicate that the number of nations with extensive WMD and missile programs will surpass thirty by the year 2000 and the level of sophistication of these programs will also continue to increase. Recent experience shows that the proliferation of these weapons produces serious regional instability and that initiating controls on these weapons is vital to ensure the ability of the United States to influence its allies and dominate its enemies. The Gulf War also provides many lessons pertaining to WMD and missiles, including the vulnerability of otherwise dominate U.S. military forces and our inability to target, destroy and defend against these weapons.

International arms control agreements have proven to be insufficient to prevent the spread of these weapons. The Missile Technology Control Regime (MTCR) is designed to limit the spread of missile systems and missile technology. It has experienced periods of great success and disastrous failure. Although U.S. pressure has drastically increased the membership, the MTCR contains inherent weaknesses the will ultimately confine the abilities of the regime.

The case of Iraq provides excellent examples of the limitations of arms control agreements. Combining seemingly unlimited resources with unwavering determination and increasingly cooperative suppliers, a situation was created where the current WMD control agreements were overwhelmed and ignored. A comprehensive study of the

evolution Iraq's ballistic missile program provides a exhaustive evaluation of both the strengths and weaknesses of the missile nonproliferation regime and provides insight into the necessary changes to increase the regimes ability to prevent proliferation.

The research in this thesis charts the objectives and intentions of the missile nonproliferation regime, then describes the evolution of Iraq's ballistic missile program. Tracing its origins to the early 1970s, this thesis provides examples of exactly how the Iraqis were able to acquire vast amounts of missile technology from a number countries. Assessing Iraq's pre-war missile capabilities and the efforts of the U.S. and the UN to limit Iraqi proliferation, this paper highlights many examples that will surface again in future proliferation scenarios. Finally an examination of Iraq's current capabilities and their ability to rebuild their programs despite serious international pressure and monitoring illustrates the need for immediate strengthening of the regime before future proliferation problems occur.

The United States can not stop the spread the WMD and ballistic missiles alone. The findings of this thesis show that additional efforts to the current regime are necessary for success. Economic sanctions, UN led monitoring and the threat of preventative war are just a few of the actions that may be necessary to prevent proliferation. If the international community is serious about limiting the spread of WMD and missiles, drastic must be taken to prove that they are united in their commitment to preventing proliferation.

I. PREVENTING BALLISTIC MISSILE PROLIFERATION

We received a wake-up call with Saddam Hussein's use of SCUD missiles during Operation Desert Storm and the new information on his ambitious nuclear, biological and chemical weapons programs. The proliferation of these horrific weapons presents a grave and urgent risk to the United States and our citizens, allies, and troops abroad. Reduction of this risk is an absolute priority of the United States.¹ [William Perry, 1996]

A. BACKGROUND

Recent conflicts demonstrate the seriousness of WMD proliferation and show that controls on these weapons are not as effective as once believed. Most notably, the Gulf War displayed the vulnerability of large powers to WMD use. The concern over the proliferation of ballistic missiles, although at the forefront of current national security issues, is not a new problem. For the last two decades ballistic missile technology has spread to developing countries at an alarming rate. Although not a new problem, the continued spread of missile technology poses a growing challenge to U.S. policy makers.

The U.S. intelligence community believes that:

1. The proliferation of ballistic missiles is significant and growing, both in terms of missiles and in terms of technical capabilities of those missiles;
2. The trends in missile proliferation is towards longer range and more sophisticated missiles;
3. A determined country can acquire an ICBM, and with little warning, by means of other than indigenous development;

¹William J. Perry, *Proliferation Threat and Response*, (Washington, D.C.: U.S. Government Printing Office), iii.

4. The North Koreans may deploy an ICBM capable of reaching the United States within five years.

Most of the developed countries and more than twenty Third World countries already possess surface-to-surface missiles or are in the process of developing them.² Current trends suggest that the number of countries with missile programs will increase in the latter half of the 1990s and that the capabilities of these systems will also become more sophisticated. The future of missile proliferation is particularly important for the United States. This is so because ballistic missiles have the ability to successfully penetrate U.S. air superiority, regional proliferation of ballistic missiles will play an increasing role in determining when and how the United States involves itself in future conflicts. In addition, ballistic missiles of developing countries will eventually have the ability to reach the continental United States. As opposed to the Cold War threat from Soviet intercontinental ballistic missiles, the widespread dispersion of missile systems to unstable Third World nations will force the United States to make important decisions regarding ballistic missile defense. This new requirement for missile defense could signal the demise of the Anti-Ballistic Missile (ABM) Treaty that was designed to codify the doctrine of Mutually Assured Destruction (MAD) by limiting Superpower emphasis on the development of ballistic missile defense systems.

The Persian Gulf War provides both military and political lessons concerning the use or threatened use of weapons of mass destruction and ballistic missiles. While Iraq

² W. Seth Carus, *Ballistic Missiles in the Third World: Threat and Response* (New York: Praeger, 1990), 5.

never acquired nuclear weapons, their relative success with its WMD programs shows that the problem is of real concern and requires immediate attention if we are to have any success in preventing or slowing the spread of these weapons. The Iraq case, however, should be viewed only as an example to gain a better understanding into the problem and of the limitations of the current nonproliferation regime because the threat from ballistic missiles today far surpasses that of Iraq's missile programs during the Gulf War.

The dramatic Iraqi missile attacks against Israel and Saudi Arabia in 1991 gave the issue unprecedented urgency. However, it was not long before public interest shifted to other issues such as the disintegration of the Soviet Union and the civil war in Yugoslavia. Most defense analysts agree that unless drastic changes are made to stem the increase in missile programs, it is only a matter of time before the problem gains too much momentum for the United States to control.

B. METHODOLOGY AND RESEARCH DESIGN

The general question that this thesis addresses is how the United States can, by force, political will, or international cooperation, stem the global proliferation of ballistic missiles. Specifically, this thesis assesses the performance of the missile nonproliferation regime in dealing with Iraq's development of ballistic missile programs.³ The case of Iraq illustrates that the pre-1992 missile nonproliferation efforts failed to control the spread of

³ This thesis defines the missile nonproliferation regime primarily as the Missile Technology Control Regime (MTCR). In addition to the MTCR, the regime includes unilateral initiatives, international export controls and the ability of the MTCR signatories to enforce these policies.

missile technology and that changes in the regime since 1992, although more effective, are still insufficient to prevent future proliferation. The lessons learned from Iraq's efforts to acquire ballistic missile technology are used to evaluate the performance of the regime during this period. This thesis then examines the efforts of the United States and the United Nations to eliminate Iraq's missile capability. Illuminating the performance of the MTCR will ultimately enable the regime to make further changes to accomplish its stated goals.

This thesis considers three elements of Iraq's missile program:

1. The acquisition of complete missile systems or key components of missiles;
2. The acquisition of missile technology in the form of education or technical know-how;
3. The acquisition of missile production equipment enabling the Iraqis to develop and produce its own missiles.

This thesis utilizes the 'case study' method. It provides the reader with an in-depth knowledge of Iraq's missile proliferation history as well as the history, intentions and objectives of the MTCR. The thesis then compares the intended objectives of the MTCR to the missile capabilities that Iraq was able to acquire in order to assess the performance of the regime.

C. CASE SELECTION

Iraq is the focus of this study because it has been through the entire spectrum of arms control efforts of the nonproliferation regime. It has been on the receiving end of counterproliferation efforts, as was shown by the Israeli attack on the nuclear reactor at Osirac. The West has also used many diplomatic strategies to deter Iraqi WMD and missile proliferation, including coercive diplomacy, deterrence with the threat of force, UN sanctions, preventative war, intrusive international inspections, and a thorough monitoring regime. In sum, Iraq has been the object of both peaceful and forceful means of dissuasion. Nevertheless, the proliferation of WMD and ballistic missiles continue.

Iraq also serves as a good case for analysis because it is surrounded by so many potential enemies. Iran, Syria, Israel and Turkey are all publicly hostile towards Iraq and all have shown ambitions for WMD acquisition.⁴ Both Iraq and its neighbors could seemingly justify the need for WMD for security reasons, however, it is internationally agreed by developed states that the existence of nuclear, biological or chemical weapons, as well as an advanced means of delivery by Arab nations, would prove destabilizing for the region and must be avoided at all costs.

D. THESIS STRUCTURE

Chapter I outlines the case selection, methodology and structure of the thesis. Chapter II analyzes the global problem of ballistic missile proliferation. It pays

⁴ *Proliferation Threat and Response.*

particular attention to the relationship between ballistic missiles and weapons of mass destruction and how both categories of weapons are of particular concern in the Middle East. This chapter sheds light on several fundamental questions that surround the issue of ballistic missile proliferation. Specifically, does the proliferation of missiles really matter, and if so, is it possible to prevent? Chapter II also examines the missile nonproliferation regime. Centered mainly around the MTCR, this chapter discusses international and unilateral efforts to control the spread of ballistic missiles and missile technology. This chapter lays out the objectives and intentions of the regime and evaluates the performance of the regime in the case of Iraq.

Chapter III analyzes Iraqi motivations for ballistic missile acquisition and development. This chapter examines the military and security threats that Iraq faces, and the role that ballistic missiles play in the Iraqi military infrastructure, and the level of prestige that these systems bring to the Hussein regime. It examines the regional and domestic situation within Iraq to ascertain the rationale for building such an extensive missile program and attempts to determine why, after being defeated in war, Iraq still attempts to retain its missile program by hiding equipment and deceiving UN inspectors.

Ultimately, examining Iraq's history allows us to better understand the motivations that states have for acquiring extensive missile programs in spite of international pressure. Having an understanding of a nation's rationale, the United States can better formulate nonproliferation and counterproliferation strategies to slow, prevent or reverse the spread of ballistic missiles.

Chapter IV discusses exactly how the Iraqis were able to acquire such an advanced missile program over such a short period of time. It examines how Iraq was able to circumvent international export laws and global arms control agreements to achieve the most aggressive and successful missile program in the region, with the exception of Israel. It describes a determined and often illicit international procurement network to acquire ballistic missiles (as well as all types of weapons of mass destruction) and how this network is still in use today and remains a real threat in the future.

This chapter provides examples that demonstrate the weaknesses and limitations of the current missile nonproliferation regime through Iraq's strategies and methods for acquiring ballistic missiles and missile technology. This chapter is of particular importance because it illustrates both the successes and failures of the regime.

Chapter V discusses the international efforts to target and destroy Iraq's missile capabilities from during Operation Desert Storm to the present. This chapter examines Coalition efforts to destroy Iraqi missiles and missile storage and production facilities as well as the efforts of the UN Special Commission (UNSCOM) to do the same. Although future proliferation incidents will be different from the Iraq case, it is useful to examine/analyze the efforts of Coalition forces and UNSCOM inspectors because it provides direction toward additional international efforts that may be required to prevent proliferation.

Chapter VI examines the current status of Iraq's ballistic missile program to ascertain just how successful the nonproliferation efforts have been in eliminating Iraq's ballistic missile program. Focusing primarily on the efforts of the UN Special

Commission after the war, this chapter shows that additions to the nonproliferation regime may be necessary to counteract the inherent weaknesses. Chapter VI also assesses Iraq's current capabilities to rebuild its missile program when the inevitable occurs and the UN sanctions are lifted.

This chapter is of particular importance because it assesses the ability of the nonproliferation regime to reverse the spread of missiles and associated technology. The regime was developed, the war was fought and UNSCOM was formed to eliminate Iraq's WMD capabilities. The current status of Iraq's programs, with estimates for the future Iraqi capabilities, ultimately measures the performance of the regime. Chapter VII states the findings and recommendations.

E. FINDINGS

There are 3 major findings:

1. Prior to 1992, the MTCR failed to complete its stated goals of controlling the spread of ballistic missile technology;
2. The existence of the MTCR, while *necessary* to *slow* missile proliferation, is not *sufficient* to *prevent* proliferation;
3. For a determined and resourceful proliferator additional enforcement is needed to counter future proliferation.

These findings provide four major implications for U.S. policy. First, the lessons from the Iraq case can be used to highlight the changes necessary for the MTCR to effectively prevent proliferation. Whether in the form of formal changes in the structure

of the agreement or in additions necessary to augment the regime in the event of another determined proliferator, it appears that the MTCR requires many changes in order to successfully meets its stated goals.

Second, this thesis helps chart future policy related to Iraq. Specifically, Iraq's past, present and potential future WMD capabilities will provide a guide for the United Nations in assessing how the international community will deal with Iraq. The future of UNSCOM inspections and the future of the UN sanctions are just two of the many policy decisions that must be made regarding Iraq.

Third, insights from the Iraq case provide a roadmap for dealing with other potential proliferators, such as Iran, Libya and North Korea. The United States has also learned, and continues to learn, much about Iraq's covert procurement network and closing this network will result in slowing the supply of ballistic missiles and missile technology.

Lastly, this thesis illustrates the imperfections and unreliability of the missile nonproliferation regime and the continuing real threat to the United States. It also shows that the United States needs to continue to pursue programs for ballistic missile defense for both the continental United States as well as deployable systems for our military personnel overseas. These findings confirm the need for a capable military counterproliferation option to be used as a another tool for preventing proliferation.

II. BALLISTIC MISSILE PROLIFERATION

This chapter examines the problem of ballistic missile proliferation and its relationship to nuclear, chemical and biological weapons. It also examines the international efforts to stem missile proliferation.

A. BALLISTIC MISSILE PROLIFERATION

The United States has achieved a great deal of military success in the post-Cold War era. Our forces are more capable and better equipped than those of any potential adversary. Although many analysts are quick to point out our inability to fight two major regional contingencies simultaneously, in the immediate future there does not seem to be a threat to our interests from a nation that we can not handle militarily.⁵ However, a small WMD capability, especially in the hands of the wrong country, can change this situation overnight. WMD and missile proliferation are major global security issues. Fortunately, because of the range and characteristics of the delivery systems, the threat remains regional and, for the meantime, does not affect the continental United States. These threats, however, have serious and immediate implications for our allies as well as U.S. military forces overseas.

⁵ The ability for the U.S. military to fight two major contingencies simultaneously has been hotly debated as the post-Cold War military draw-down continues.

1. Characteristics of Ballistic Missiles

Ballistic missiles are unmanned, guided weapons/delivery systems having one or more rocket stages that typically provide propulsion over a small portion of a flight path. During most of their flight path, missile warheads traverse a free-flight ballistic trajectory which, for longer range missiles, is partially or totally above the atmosphere. Flight times to targets range from a few minutes for short-range tactical systems to about thirty minutes for ICBMs.⁶ Ballistic missiles can deliver either conventional or unconventional warheads.

Part of the military value attributed to ballistic missiles stems from a commonly held view that there is no defense against them. The performance of the U.S. Patriot missile defense system could alter this perception, but the true value of the Patriot system against a serious missile attack has not yet been proven.

2. Ballistic Missiles and Weapons of Mass Destruction

Ballistic missiles with ranges over a few hundred kilometers have proven to be exceptionally inefficient when compared to other weapon systems.⁷ Armed with conventional warheads, ballistic missiles have never been decisive in any conflict where they have been employed.⁸ This has long been recognized by the nuclear powers, which

⁶ John R. Harvey, "Regional Ballistic Missiles and Advanced Strike Aircraft: Comparing Military Effectiveness," *International Security*, 17, no. 3 (Fall 1992): 43.

⁷ *Ibid.*, 47.

⁸ The Iran-Iraq War and the second Gulf War displayed the tactical and strategic utility of ballistic missiles in a major confrontation and there is disagreement regarding the decisiveness of missile use during these conflicts. For a full description of the use of missiles see: Martin S. Navias, *Going Ballistic: The Build-up of Missiles in the Middle East* (London: Brassey's, 1993).

rely on ballistic missiles for the delivery of their nuclear warheads. This inefficiency has also been realized by new missile states, since it is widely believed that most intend to use ballistic missiles as a delivery system for nuclear, chemical or biological weapons.⁹

Since the end of World War II, the major powers have acted to contain the spread of nuclear weapons. For the most part, their efforts have been successful and have limited nuclear capabilities to a few nations. The Nuclear Nonproliferation Treaty (NPT) has been the cornerstone of this effort. Recently, however, the debate on controlling the proliferation of ballistic missiles has evolved from initial concerns about their role as delivery vehicles for nuclear weapons to broader concerns about missiles as carriers of other types of unconventional weapons. As John Harvey states, "the issue of concern is not ballistic missile proliferation itself but the acquisition of weapons of mass destruction, including delivery vehicles of sufficient range, by irresponsible states."¹⁰ Therefore, a study of ballistic missile proliferation must include the delivery of conventional, chemical and biological warheads as well as nuclear warheads.

B. DOES BALLISTIC MISSILE PROLIFERATION MATTER?

An important challenge to the rising concern over ballistic missile proliferation is the gravity of the problem. There is an argument that if ballistic missiles do not introduce

⁹ Trends indicate that most nations pursuing CBW also pursue ballistic missile programs. See: *Proliferation Threat and Response*, (Washington, D.C.: U.S. Government Printing Office, April, 1996).

¹⁰ John Harvey, *Assessing Ballistic Missile Proliferation and Its Control* (Stanford, Calif: Stanford University Press, 1991), 167.

new or greater capabilities--if they do not increase a state's ability to inflict death and destruction--it is of no great consequence whether or not new countries are trying to acquire them. Using this argument, instead of focusing on militarily trivial ballistic missiles, greater attention should be devoted to the control of other weapons with greater military capability.¹¹

From this perspective one of the greatest dangers of missile proliferation is over-reaction. The risk of over-emphasizing ballistic missiles is said to have two consequences. First, this emphasis on the problem of ballistic missile proliferation can overshadow or draw attention away from other more dangerous weapon systems like nuclear, biological or chemical weapons. Second, it could lead to unnecessary hampering of the defense industry in the form of military missile technology as well as having a negative effect on other areas of the civilian industry, such as civilian space programs.

Skeptics argue that in most circumstances manned aircraft are a more effective delivery system than ballistic missiles, carrying greater payloads and delivering with greater accuracy.¹² Regional ballistic missile forces tend to be too small and too inaccurate to seriously threaten neighboring countries. They also argue that ballistic missiles alone have little destructive power, and that it is the proliferation of NBC warheads that should receive a majority of nonproliferation efforts. In contrast, it must

¹¹ This argument surfaces when discussing the use of landmines or hand-grenades which kill or wound far more people than ballistic missiles. It is especially prominent when discussing the transfer of manned aircraft and cruise missile technology.

¹² For a complete description of the benefits of manned aircraft vs. ballistic missiles, see: W. Seth Carus, *Ballistic Missiles in the Third World: Threat and Response*, (New York: Praeger, 1991), 40.

be noted that ballistic missile programs typically cause far greater instability than any other weapons system, including advanced aircraft.¹³ This instability derives from two features:

1. These missiles can easily be modified to carry chemical or biological weapons;
2. Ballistic missiles have the ability to penetrate an enemy's airspace, including that of the United States.

The pace of missile proliferation in the 1980s leaves little doubt that many regional powers feel that these weapons are worth their price and, perhaps, that merely possessing a missile research program provides a level of status and a similar deterrent value to a successful missile program. This argument demonstrates that ballistic missiles are rarely, if ever, decisive on their own, but that they can have effects that are disproportionate to their actual destructiveness. Even small numbers of ballistic missiles can be highly significant politically. The inability to target or defend against an enemy equipped with ballistic missiles assures their military significance and a nation equipped with ballistic missiles enjoys the luxury of assured penetration. Responding to a question about the use of German V-2 rockets during WW II, then Chief of the Royal Air Force, R.V. Jones stated that the reason for their effect lies in basic human fears:

The answer is simple: no weapon yet produced has a comparable romantic appeal. Here is a 13 ton missile which traces out a flaming ascent to heights hitherto beyond the reach of man, and hurls itself 200 miles across

¹³ Ibid., 44.

the stratosphere at unparalleled speed to descend on a defenseless target. One of the greatest realizations of human power is the ability to destroy at a distance, and the Nazeus [sic] would call down his thunderbolts on all who displease him.¹⁴

Critics who insist that conventionally armed missiles are merely psychological weapons can be dismissed by sensible military planners that they miss the point that much of warfare is psychological, too. As Aaron Karp states, "the essence of warfare is not measured purely in terms of destruction but in the ability to use force and threats of force to achieve political goals. Weapons that intimidate or panic an adversary have a military significance that is different from, but not necessarily any less than, that of weapons more efficient in killing and destroying."¹⁵

C. CAN BALLISTIC MISSILE PROLIFERATION BE PREVENTED?

Classical realists argue that advances in military technology are virtually unstoppable. They feel that the proliferation of advanced weaponry is so far beyond reach that policy making has no chance to halt its progress. Similar arguments suggest that military technologies evolve from their internal logic that, once proven effective by the larger powers, will not stop until all states possess the weapon or until it is replaced or proven ineffective. This idea of a 'blind force' compelling governments to pursue military

¹⁴ Kagan, "Iraq Case," 186.

¹⁵ Carus, *Ballistic Missiles in the Third World*, 49.

technology is discussed in Aaron Karp's study on missile proliferation.¹⁶ Termed "self-sustaining technological momentum", "the technological imperative", or "technological creep", it implies that once a military infrastructure becomes necessary for the success or survival of a given nation, it is extremely difficult and often impossible to stop the diffusion of weapons technology.

Historically, weapons proliferation is not as deterministic. One must only look at the advent of nuclear weapons to ascertain that the widespread proliferation of new technology is far from inevitable. In fact, it is a goal of this thesis to show that large states, given a certain level of conviction and resolve, ought to be able to stop smaller states from acquiring new technologies felt to be inappropriate.

With the rise of dozens of missile programs in the 1980s, it is impossible to ignore that these nations see some political and military utility in ballistic missiles. The problem, however, is much more complicated. Like nuclear weapons, the production of ballistic missiles is extremely complicated and often unsuccessful. Although they seemingly appeared out of nowhere, the ballistic missile programs of the 1980s were started perhaps ten or twenty years earlier. Although many programs continue, many others have not produced successful missile programs while others have proven successful, however, due to international pressure they have been terminated. Therefore, the inevitability of widespread development of ballistic missiles could be exaggerated.

¹⁶ Aaron Karp, *Ballistic Missile Proliferation: The Politics and Technics*, (New York: Oxford University Press, 1996), 8-15.

D. THE MISSILE NONPROLIFERATION REGIME

Four multilateral arrangements control the transfer of dual-use military technology. They are (1) the Wasenar Arrangement, formerly the Coordinating Committee for Multilateral Export Controls (COCOM), for restrictions on a wide range of items that affect military capabilities; (2) the Nuclear Suppliers Group (NSG) or London Suppliers Group that restrict the transfer of nuclear items; (3) the Australia Group for chemical and biological items; and (4) the Missile Technology Control Regime (MTCR) for missile systems, technology and production equipment.

The goal of this section is to describe the international efforts for the control of ballistic missiles. Although this thesis shows that additions to the regime are necessary, it also demonstrates that the regime has experienced a great deal of success and is usually capable of slowing, if not stopping, the spread of missile technology.

1. The Missile Technology Control Regime

The MTCR is an informal non-treaty association of states having a common interest in limiting the spread of ballistic missiles and missile technology. According to the guidelines, the original purpose of the MTCR was to "reduce the risk of nuclear proliferation by placing controls on equipment and technology transfers which contribute to the development of unmanned nuclear delivery systems."¹⁷ Over time, that goal was expanded to limit the risks of the proliferation of weapons of mass destruction by

¹⁷ Deborah A. Ozga, "A Chronology of the Missile Technology Control Regime," *The Nonproliferation Review*, 2, no. 3, (Winter 1994): 66-93.

controlling the transfers that could make a contribution to delivery systems for such weapons.

The regime's guidelines break exports into two categories. Category I regulates the exports of complete missile systems and unmanned air-vehicle systems capable of delivering a 500 kilogram payload to a range greater than 300 kilometers. Category I also regulates the export of complete subsystems such as rocket stages, motors, guidance components and production equipment. Items listed under Category I stand little chance of being granted a license to be exported (with the exception of missile production equipment which is totally prohibited). Transfer is only permitted if the receiving nation assures, through diplomatic dialogue, that the items are being used for legitimate or non-military purposes and that they will not be modified, reproduced or retransferred.

Items listed in Category II are missile parts and equipment that are dual-use in nature. These items are propulsion components, propellants, structural composites and materials, flight and navigation equipment, ground support equipment or the equipment to design or build production facilities. Although Category II items are less tightly controlled than Category I items, the receiving nation must guarantee that the end-use of the transfers will not be associated with its WMD programs. The country's past arms control history, particularly in the field of WMD, is strongly considered before permission for the export is granted.

There are three historical landmarks that show the need for control of ballistic missile technology. First is the pervasive role of Western assistance in the missile programs in the Third World. The most notable example of this was Western European

assistance in the Argentinean CONDOR II program. This proved significant because it showed the limitations of the regime to punish known MTCR violators. Second was the introduction of China as a missile exporter. China's sale of CSS-2 missiles to Saudi Arabia in 1987 showed the severity of the proliferation problem. Third was the use of SCUD missiles during the Iran-Iraq War, most importantly, the impact that these missiles had on the civilian population.

a. History

The origins of the MTCR date back to the 1970s when the United States became aware of the dangers posed by missile programs of developing nations. Just as India's nuclear test in 1974 was the monumental event that alerted the developed world of the problem of nuclear proliferation, so too was India's 1980 test of a space launched rocket (SLV) an alert to the problem of missile proliferation by developing nations. Early concerns for ballistic missile proliferation were first brought to international attention during the 1976 Geneva Convention where the problem of the proliferation of long-range systems was first introduced. It was during this time that the developed world saw the destabilizing nature of advanced missile systems and that they needed immediate controls.

A U.S. interagency task force began to look at the problem of missile proliferation in 1981. In 1982 secret talks were initiated with U.S. allies. Although primarily a U.S. initiative, the original MTCR was negotiated by the 'G-Seven' industrialized nations: the United States, Great Britain, Germany, Canada, France, Italy

and Japan. No additional nations joined the regime before 1990, but by 1992, 22 countries had become members. Today 28 nations are members.

Early Soviet attitude towards the MTCR was understandably negative. The Soviet Union opposed the regime for three main reasons. First the negotiations for the regime were conducted in secret and the Soviets refused to adhere to an agreement that they did not participate in drafting. Second, the Soviets felt that the MTCR was another attempt at a COCOM-type treaty. They felt that COCOM, and now the MTCR, was an attempt by the West to confine and restrict the Soviet economy. The Soviet Union had exported thousands of missiles during the 1980s and the MTCR would only serve to limit these sales. Third, the Soviets felt threatened by the 1987 Israeli test of the JERICO II missile and the inherent limitations brought on by the MTCR would only serve to make the threat more pronounced.

b. Strengths and Weaknesses

The MTCR generally has proven to be a successful instrument for slowing the spread of ballistic missile technology. Examples of the regime's successes can be seen in the dismantling of Argentina's CONDOR II program and the cancellation of several Brazilian systems throughout the 1980s and early 1990s. The reluctant adherence by China, once a target of the MTCR, provide an example of the influence of the regime and its members. Although not without flaws, the regime continues to bring light to the problem of missile proliferation and sends a signal to potential proliferators that their programs are not going unnoticed.

The MTCR does, however, have a significant number of shortcomings that continue to impede its ultimate success.¹⁸ These weaknesses include:

- Although membership has grown dramatically over the past five years, the regime suffers because of limited membership. The regime is doomed to fail if non-MTCR signatories reap the benefits of not adhering to the guidelines.
- As a supplier's regime, it is inherently discriminatory. This type of policy is said to cause greater friction between developed and developing nations and could ultimately lead to greater instability.
- As a supplier's regime, the MTCR ignores the demand for ballistic missiles. Although the MTCR is currently looking at regional issues, opponents to the regime state that addressing the supply of missiles examines only half of the problem.
- The MTCR was designed to prevent the spread of long range-missiles to countries that possessed a nuclear weapons capability. The regime was not originally intended to prevent the spread of missile technology to developing nations.
- The regime lacks any kind of verification mechanisms to enforce the guidelines.
- Although a Sanctions Law is now in place, it has only recently been exercised.¹⁹
- Opponents state that without the threat of punishment for violations, the regime will never be strong enough to enforce.
- The guidelines for the regime are currently interpreted by each nation. The fact that some countries interpret the regime more liberally than others will lead to disagreements among members as to the exact meaning of the agreement.

¹⁸ For a description of the strengths and weaknesses of the MTCR, see Brad Roberts, *Weapons Proliferation in the 1990s*, (London: MIT Press, 1995), 121.

¹⁹ The Sanctions Law has recently been used against South Africa, Russia, India, Pakistan, Syria, China, Iran and North Korea.

- The regime was drafted and ratified without including the most guilty of missile exporters. As a regime to prevent the spread of missiles, the MTCR must address the nations that are exporting a majority of the systems. Russia is now joined by China and North Korea as the main missile exporters, however, they were not part of the drafting of the MTCR.²⁰

China, the Soviet Union and the United States had scheduled bilateral talks on missile proliferation, but these talks were cancelled after the events at Tiananmen Square in June of 1989.²¹ Subsequent talks with China and Russia led both states to agree to adhere to the regime's guidelines. However, both have been accused of MTCR violations. China was accused of violations in 1993 and in subsequent years with the suspected sale of M-11 missiles to Pakistan,²² and Russia has been accused of export violations with suspected shipments to Iran and Iraq.

2. Unilateral Export Controls

Most Western countries have unilateral controls, with varying degrees of effectiveness, on exports of missile systems and technologies. These national controls supplement the multilateral arrangements. For the United States, the Arms Export Control Act of 1976 (AECA) and the Export Administration Act of 1979 (EAA) serve as the principal domestic legislation for the control of missile technology.

²⁰ China agreed to adhere to the regime in 1994 and Russia became a member in 1995. North Korea is the only country that continues to overtly export complete systems.

²¹ "U.S. Fears that China Again May Sell Missiles," *New York Times*, 11 November 1989, p. A14.

²² Zachary S. Davis, "China's Non-Proliferation and Export Policies," *Strategic Digest*, November 1995, 1681, and *Asian Survey*, Vol. 35, No. 6, June 1995.

a. Arms Export Control Act

The AECA authorizes the Department of State to regulate all defense-related exports from U.S. Government sources as well as civilian defense contractors. The AECA also authorizes the State Department to compile and manage a list of defense items that cannot be exported called the U.S. Munitions List. Sections of this list which regulate the transfer of missile technology include Category IV (Launch Vehicles, Guided Missiles, Ballistic Missiles and Rockets), Category VIII (Aircraft and Spacecraft), Category XI (Military and Space Electronics), and Category XVII (Technical Data).²³

b. Export Administration Act

The EAA gives the Commerce Department jurisdiction not only over weapons, but also over all items or technologies that could make a significant contribution to the military potential of any country. Even if the exporter meets the licensing requirements of the Commerce Department, the President or State Department may still prohibit the export for reasons of National Security. Some nations, such as France and Germany, have considerably more lenient export control laws than that of the United States. While most items under the MTCR also fall under U.S. export control laws, not all items under the MTCR fall under other countries export control laws.

3. Bilateral Export Controls

Since 1988, Russia and the United States have engaged in bilateral talks about missile proliferation. During the September 1989 meeting between Secretary of State,

²³ John R. Harvey, "Regional Ballistic Missiles," 118.

James Baker, and Soviet Foreign Minister Shevardnadze, the two countries discussed limiting missile proliferation through an international mechanism such as the International Atomic Energy Agency (IAEA), however, the MTCR is a well-defined agreement that has enjoyed a substantial amount of international support and will remain the primary agreement for the control of missile technology. Russia had agreed to uphold the MTCR agreement while falling short of completely adhering to the regime until 1995 when they became a member.

E. CONCLUSION

As the United States and its allies constantly review and revise their export control policies to address the proliferation policies of the post-Cold War era, we must examine existing agreements to determine the best solution for a complicated problem. At the same time, the United States cannot rely solely on supply-side strategies. Export controls, for example, are only likely to delay the acquisition of critical dual-use technology by a state determined to acquire them. Until the United States and our allies address the demand for weapons of mass destruction as well as pressures to supply those demands, nonproliferation efforts will be incomplete.

III. IRAQI MOTIVATIONS FOR ACQUIRING BALLISTIC MISSILES

Over the past two decades, Iraq's foreign policy, military and weapons acquisition strategies seem to be driven by the personal ambitions of Saddam Hussein. Since the Gulf War, Saddam has pursued three closely related objectives:

1. To assure his own survival and the survival of the regime from both international and domestic threats;
2. To restore Iraq's sovereignty and independence while reducing foreign interference in its internal affairs;
3. To rebuild the country's armed forces and restore its military capabilities.

This third objective is necessary for achievement of the first two and it is the motivation for this objective, with particular emphasis on ballistic missile capabilities, the focus of this chapter.²⁴

Iraq's motivation for a ballistic missile program can be divided into three main categories. However, these categories become interrelated and overlap significantly. The emphasis for these motivations has also changed over time as the threats to and ambitions of Iraq have changed. Although conclusions are possible, determining which motivations had greater influence on Iraqi military decision-making is somewhat speculative. Assessing how these weapons fulfill Iraq's strategic and tactical objectives provides valuable insight into Iraq's motivations for acquiring ballistic missiles. This could then

²⁴ Simon Henderson, *Instant Empire: Saddam Hussein's Ambition for Iraq*, (San Francisco: Mercury House, 1991), 52.

be compared to Iraq's declared policy and subsequently compared to Iraq's actions in order to determine if declared defense policy matches the weapons systems currently being sought, imported or produced. This analysis should also assess why other weapons systems, such as high performance aircraft, have been foregone in favor of ballistic missiles.

The first category of Iraqi motivations for ballistic missile acquisition are Baghdad's perceived security or military threats. Iraq has serious foreign security threats and has the right to maintain an army to defend themselves. Domestic security threats are also a major rationale for the restoration of the Iraqi military as was shown by the recent religious and ethnic struggles that continue to threaten the Hussein regime.

The second category falls under the concept of the level of political prestige and influence that may be derived from possessing a ballistic missile program; in short, it may be substantial. In addition to being able to deter potential enemies, ballistic missiles serve as status symbols. An analysis of Iraqi emphasis on military prestige and the need to prove technical competence makes Iraq a unique case. Although the prestige derived from a successful missile program may not be a decisive factor in most ballistic missile programs, prestige and proving technical competence has played a significant part in the Iraqi missile program.

Institutional factors that drove the Iraqi ballistic missile program are the third category. The emphasis given to Iraq's entire WMD program was astounding and Saddam Hussein demanded results quickly; thus one can ascribe a high level of competitiveness between key actors belonging to Iraq's military-industrial infrastructure. The arms race

within Iraq, combined with the willingness of foreign suppliers, provoked a certain competition within this relatively small nation as success was based on the speed and level of production.

A. MILITARY AND SECURITY CONCERNS

In 1974, Iraqi acquisition of SCUD-B missiles from the Soviet Union began. Modification of these missiles began in 1987.²⁵ While hatred dominates Iraqi-Persian relations, open hostilities between Iran and Iraq did not begin until the onset of the Iranian Revolution in 1978-79. This indicates that the threat from Iran was not the primary reason for acquiring ballistic missiles in 1974, but was the major reason for the modification of Iraq's SCUD-B missiles in 1987. The most apparent threat facing Iraq at the time of the initial acquisition was from Israel.²⁶ Assumed to be a nuclear power, Israel was, and still is, said to have the most sophisticated ballistic missile program in the Middle East.

The Israeli missile program revolves around two specific missile systems. First is the MGM-52 C Lance system that Israel acquired from the United States in early 1975. The LANCE has a range of 130 kilometers and a CEP (circular error probable) of

²⁵ Rachel Schmidt, et al., *Global Arms Exports to Iraq, 1960-1990*, (Santa Monica: Rand, 1991), 21.

²⁶ Efraim Karsh, *Saddam Hussein: A Political Biography* (New York: The Free Press, 1991), 136.

approximately 150 meters.²⁷ This missile system posed little regional threat to neighboring countries, with the possible exception of Syria, because of its short-range and poor accuracy. Even though this missile posed no threat to Iraq, it established that the Israelis possessed the most capable weapons system in the region. Second, the more secretive JERICHO missile, developed with assistance from the French, is believed to be a solid-fueled rocket that has potential payload of 600 kilograms, large enough for the delivery of nuclear weapons and can be deployed on a TEL (transporter, erector, launcher).²⁸

Now divided into two separate weapons systems, the JERICHO I and II, with a range of 600 and 1600 kilometers respectively, remains the most capable missile system in the Middle East.²⁹ Similar to its nuclear weapons program, the Israeli's will neither confirm nor deny the existence of the JERICHO missile systems. In 1989, however, the U.S. Department of Defense confirmed the existence of the JERICHO missiles, believed to be intended "as a delivery system for its nuclear, chemical or high explosive warheads."³⁰ Although the LANCE and the JERICHO make up the core of the Israeli missile capability, it was the Israeli emphasis on missiles during 1960's and early 1970's

²⁷ Duncan Lennox ed., *Jane's Strategic Weapons Systems*. (United Kingdom: Sentinel House, 1996), 90.

²⁸ *Ibid.*, 90.

²⁹ *Ibid.*

³⁰ Norman Kempster, "Pentagon Discloses Israeli Nuclear Missile," *Los Angeles Times*. November 5, 1989.

that made others in the region, particularly the Iraqis, pursue acquisition of these weapons, leading to the Iraqi SCUD-B purchases in 1974.

The existence of Israel's superior ballistic missiles, combined with their alleged nuclear capability posed an obvious threat to Iraq, to say nothing of other factors such as religious, or cultural differences that dominate the Arab-Israeli relations. This threat was a major factor in Iraq's quest for a nuclear weapon as well as missiles capable of reaching Israel. Possessing a weapon that could deter the Israelis became paramount for all Arab nations and, since Saddam Hussein was the self-proclaimed leader of the Arab world, the task of countering the Israelis fell to him. Saddam himself stated the need to deter Israel with missiles when he stressed: "A just peace is possible when, if Israel possesses one missile, the Arabs possess one missile, so that neither can use it."³¹

This perceived military imbalance worsened when the Israelis attacked and destroyed the Iraqi nuclear facility at Osiraq. Committed to revenge, Iraq continued its nuclear weapons program underground and it was not until 1991, after the Gulf War, that the Western world realized how close the Iraqis had come to manufacturing a deployable nuclear device.³² Coinciding with this capability Iraq also needed a reliable delivery system that could threaten Israel, yet still attain its stated goals of domestic production.

³¹ Quoted in Kenneth Timmerman, *The Death Lobby: How the West Armed Iraq*, (London: Fourth Estate, 1992), 382.

³² It is logical to assume that, given Iraq's extensive nuclear weapons programs, they would have eventually sought a capable ballistic missile for nuclear warheads. While it appears that the initial intent of the AL HUSSEIN project was not related to a nuclear weapons delivery system, there is evidence that this missile (in modified form) may have been selected for this purpose in later programs.

Additionally, the Iraqis also feared another attack against their NBC or missile facilities. Unlike the Israelis, however, Iraq could not support an advanced aircraft program and still have any hope of indigenous production. Iraqi aircraft were also unable to penetrate Israeli air space due to the superiority of the Israeli Air Force and air defense systems.

The Iraqis chose to rely on ballistic missiles as a delivery system for their conventional and unconventional warheads because they satisfied their three major goals for a missile program.

1. Ballistic missiles gave the Iraqis the ability to penetrate Israeli air space.
2. They gave Iraq the ability to someday produce missiles indigenously in an attempt to become more self-sufficient.
3. Missiles also allowed the Iraqis to deploy an offensive weapon that had little chance of being used against the regime in the event of a military coup.

Iraq felt that possession of ballistic missiles would deter Israel from conducting another strike against its WMD facilities.³³

Iraqi motivations for ballistic missiles then turned to its second largest threat, Iran. The Iranian revolution of 1978-79 had tremendous significance for Iraq, because it signaled the end of the 'cold peace' between the two countries that had existed since 1975. In particular, the fall of the Shah resulted in the end of the Algiers Agreement and the resurgence of the Kurdish question.³⁴ In addition, the establishment of a populist Shi'i

³³ Henderson, *Instant Empire*, 126.

³⁴ Peter Sluglett, ed. *Guide to the Middle East*, 92. The Algiers Agreement of 1975 restored the boundary between the two countries and issued land to Iraq's Kurdish population.

government in Iran was a matter of grave concern to Iraq and set the two nations on a collision course.

Saddam Hussein resurrected the old disagreements over the boundary between the two countries in the Shatt al-Arab region and the status of the Southwest Iranian province of Khuzistan/Arabistan. Saddam Hussein used the frequent cross-border incidents as a pretense for going to war with Iran on September 22, 1980, leading to the largest exchange of ballistic missiles during a 52-day period of the war termed the 'war of the cities'. As opposed to their deterrent effect on the Israelis, Iraq's missiles were meant to be used against Iran. Indeed the AL HUSSEIN range modification program was the direct result of Iranian missile attacks on Baghdad. Iraq needed to respond and strike Tehran. The AL HUSSEIN was the weapon system designed to accomplish this objective. In December 1989, then Foreign Minister, Tariq Azziz said that:

Iraq is still threatened by Iran...consequently we will do our best to acquire the necessary defense equipment required to defend our country in case the other side contemplates the resumption of hostilities.³⁵

Locked in an all out war, Iran began using SCUDs against Iraqi cities in 1985.³⁶ The effect of these missiles on the Iraqi population, especially during the 'war of the cities', was tremendous. Seth Carus maintained that:

³⁵ Navias, *Going Ballistic*, 50.

³⁶ Karsh, *Saddam Hussein*, 154.

Missiles fired at Baghdad and Teheran...caused tremendous damage seemingly out of proportion to the size of their warhead. In some cases, entire streets of shops and houses were destroyed. In other instances reinforced concrete skyscrapers were devastated by missile strikes. Typically, the missiles left craters at least 10 meters across and several meters deep.³⁷

During the Iran-Iraq War, Iran launched at least 117 SCUD-Bs while Iraq launched over 300, (mainly the AL HUSSEIN versions) 160 of which were fired during the 'war of the cities'.³⁸ The use of these missiles also supplemented the seriously depleted ground forces and air power of both sides. After the war Iraq claimed victory and credited the AL HUSSEIN missile for 'bringing the Iranians to their knees'.³⁹ The military and political effect of these missiles was realized by all nations, particularly the Middle East, and played heavily into Iraq's continued rationale for a ballistic missile program.

The second Gulf War did little to alter Iraqi motivation for ballistic missiles. Fortunately, the Iraqi SCUD attacks on Israel and Saudi Arabia were militarily ineffective. However, SSMs proved to be the only weapon system to have an appreciable effect on coalition forces. The increasing availability of missile technology combined with the potential use with unconventional warheads has drawn international attention even more sharply to the use of missiles as a delivery system. Although other platforms have proven more capable, accurate and possess longer ranges, the ease with which missiles and

³⁷ Carus, *Ballistic Missiles*, 31.

³⁸ Ibid., 32.

³⁹ Most would agree that the use of chemical weapons had an equally large, if not greater, effect on Iran.

missile technology were acquired, used, maintained and concealed have made them increasingly attractive to smaller powers like Iraq.

Domestically, the Iraqis have learned that many weapons, particularly combat aircraft, are a potential coup weapon, whereas ballistic missiles are not. As an oppressed nation of divided ethnic and religious groups presently suffering under an oppressive regime, the chances of the government being overthrown by a military coup is always a possibility. As opposed to other weapon systems, ballistic missiles would probably not be utilized in the event of a military or popular coup.⁴⁰

B. PRESTIGE AND LEGITIMACY FACTORS

The second category of motivation for Iraqi acquisition of ballistic missiles is for the prestige and legitimization that these weapons bring to the governments that deploy them. The Iraqi quest for legitimization can be thought of at three different levels:

1. In global terms, it can be understood as the Iraqi need for advanced weapon systems to gain prestige as a legitimate military power as well as to deter Western intervention into Middle Eastern affairs.
2. In a regional sense, Saddam Hussein required these weapons to appear strong to other Arab nations and to deter potential regional adversaries.
3. Domestically, these weapons legitimized Saddam Hussein as a competent leader; a leader not just of Iraq but of the entire Arab world.⁴¹

⁴⁰ Sluglett ed. *Guide to the Middle East*, 92.

⁴¹ Henderson, *Instant Empire*, 94.

As Iraqi Culture and Information Minister, Latif Nusayyif, stated in December 1989:

Our acquisition of these formidably sophisticated technological and military capabilities is not meant for aggression...we have acquired these [missile] capabilities to safeguard the dignity of this nation and preserve its image as a nation cherishing tolerance, generosity and human interaction.⁴²

Nusayyif's emphasis on 'these formidable and sophisticated technological and military capabilities' indicates that the prestige of ownership was undoubtedly a substantial motivation for the Iraqi acquisition of ballistic missiles.

While the Israelis and other missile-producing nations have gone to great lengths to keep their missile programs in complete secrecy, Iraq has never disguised its intentions or abilities to acquire, modify, produce and use ballistic missiles. At the 1989 Iraqi Arms Fair, missiles were proudly paraded in front of the Iraqi people as well as the international public and, although specific information pertaining to these missiles, such as source of technology, site locations and order of battle were not publicly announced, the missile capabilities and potential for use was information that was widely publicized.

For the Iraqis, and others in the Middle East, the ability to master the complexities of guidance technologies, rocket fuels, metallurgy and other aspects of ballistic missiles, is a reflection of a state's technical sophistication and competence.⁴³ In Baghdad's eyes, missiles served the purpose of a 'technological demonstrator' or symbol of domestic

⁴² Kagan, *Iraq Case*, 188.

⁴³ Navias, *Going Ballistic*, 48.

technological competence. An example of this was when Iraq fired its first space rocket launcher in 1989, Baghdad Radio reported: "By this the Iraqis prove yet again that possession of science and knowledge is not exclusive to certain countries and [a matter] on which they can have a monopoly."⁴⁴

Although most experts in Middle Eastern affairs would agree that prestige considerations were secondary to that of legitimate Iraqi security concerns, they were important because Saddam Hussein believed that missiles would help to reinforce his standing with the Iraqi people, his Arab neighbors and the entire world. For Saddam, who clearly saw himself as the leader of the Arab world, such status symbols were not only important, they were a necessary part to retaining his power. As Aaron Karp has stated: "Even if particular missiles do not change a country's military capability, their symbolic power may alter the perception of national leaders within the deploying country and among its adversaries."⁴⁵

C. INSTITUTIONAL AND ECONOMIC FACTORS

In most nations, the success of a particular weapons program is primarily due to the efforts of a small group of individuals, perhaps even one person. This person could be a political, military or scientific leader who convinces the nation's leadership that a particular program is necessary or at least requires more emphasis. An example of such

⁴⁴ Kagan, *Iraq Case*, 190.

⁴⁵ Aaron Karp, "Ballistic Missiles in the Third World," *International Affairs* 9, no.3 (Winter 1984/85): 168.

an occurrence was the efforts of Lieutenant General Erich Heinemann who was known as the father of the German V rockets. Heinemann, who was also the one who convinced Adolf Hitler to place more emphasis on missile research instead of other projects, was the single greatest factor for the success of Germany's V rocket program. Dr. A.P.J. Kalam is another example. Dr. Kalam played a major role in the development of India's missile program as director of the Defense Research and Development Organization. Perhaps the best example is the relatively small group of American and British scientists and engineers who controlled the early stages of the research for the first atomic bomb -the Manhattan Project.

The theory behind institutional factors to a missile program is effectively captured by Donald MacKenzie in his book entitled, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*.⁴⁶ In this book, MacKenzie introduces how institutional factors spurred the ballistic missile guidance programs of the United States. These political and organizational factors involve competition between organizations, in the form of inter-service or inter-agency rivalries, or individuals, in the form of engineers and scientists that manage these programs. In Iraq's case, all of their missile programs competed for resources. Run by a relatively small number of engineers, logic dictates that getting them all to work on one project would lead to greater success.

Similar to the above examples, Iraq's missile efforts consisted of a small group of individuals who controlled the purchase, deployment, modification and reverse

⁴⁶ Donald McKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, (London: MIT Press, 1990), 20.

engineering of their missiles.⁴⁷ Although the specific personnel who initiated and controlled Iraq's ballistic missile projects are classified within U.S. intelligence reports and UNSCOM inspection documents, it is logical to assume that the competition between this relatively small group of individuals was a substantial portion of the drive for Iraq's ballistic missile research.⁴⁸ Therefore, the motivations for the acquisition of ballistic missiles fell upon a select group of individuals: Iraq's missile experts. As was the case with anyone who operated under the Hussein regime, results were the priority and, aided by the availability of missiles and related technology, Iraqi desire for ballistic missiles increased.

The Iraqis also employed many different projects and information gathered about these programs implies that these projects had little interaction with each other and led UNSCOM inspectors to feel that these programs lacked strategic coordination and were possibly overwhelmed by the massive numbers of weapons being imported.⁴⁹

Economic motives were also a factor for Iraqi emphasis on production of ballistic missiles. Although Iraq never exported any missiles, doing so, especially to other Arab nations, in the future would undoubtedly be in Iraq's financial interest. In 1989, the Iraqi Minister of Industry and Military Industrialization, Husayn Kamil Hassan, stated that:

⁴⁷ Henderson, *Instant Empire*, 158.

⁴⁸ The specific individuals that make up Iraq's ballistic missile experts is classified and beyond the scope of this study. These individuals, as well as Iraq's entire covert procurement network, continues to be investigated by the United Nations today and is not necessary to understand the point of Iraq's institutional motivations for ballistic missiles.

⁴⁹ Derived from interviews with UNSCOM inspectors.

"Iraq was studying requests from a number of states to purchase Iraqi weapons" and that "weapons will be given to Arab states or to friendly states that support the Arabs."⁵⁰

Although not specifically stating the exporting of ballistic missiles and understanding that public statements are not definitive of future Iraqi actions, doing so would appear to satisfy three key objectives for the Iraqis.

1. It would allow them to generate some revenue to lower the cost of their own missile program. If revenue was not a motive for missile sales it could be assumed that the Iraqis would trade Iraqi-made missiles for other WMD technology.⁵¹
2. Selling (or perhaps even giving) Iraqi-made missiles, particularly to other Arab nations, would give Saddam Hussein increased prestige among his fellow Arab leaders.
3. Exporting Iraqi missiles would cause considerable international concern, particularly to the United States. Saddam Hussein could use this to his political advantage.

Another economic consideration when examining the motivations for ballistic missile production would be to examine the cost and benefits of alternative weapons. As discussed earlier, Iraqi aircraft would be much better suited to deliver the necessary ordnance to the enemy. Iraqi Su-24 aircraft have twice the range as AL HUSSEIN missiles and can deliver over 17,000 pounds of explosives compared to 400 pounds on the AL HUSSEIN. However, there are four key reasons why ballistic missiles are a better

⁵⁰ Mark H. Kagan, "Iraq's Case: The International Trade and Proliferation." in William C. Potter and Harlan C. Jencks, eds., *The International Missile Bazaar: The New Suppliers' Network* (Boulder: Westview Press, 1994), 185.

⁵¹ Henderson, *Instant Empire*, 158.

alternative than increasing development of an Iraqi Air Force. First, the cost of the infrastructure necessary for a capable Air Force dwarfs that of a ballistic missile program.

Second, the Iraqi's knew that they have a better chance of producing relatively unsophisticated missiles as opposed to aircraft. Third, as mentioned earlier, the regime in Baghdad knows that aircraft are a potential coup weapon. Lastly, ballistic missiles give Iraq some level of assured penetration into enemy airspace, whereas, with the superior capabilities of the Israeli Air Force and Israeli air defense systems, would preclude Iraqi air superiority.⁵²

In addition to domestic production and the possible sale of ballistic missiles, Iraq showed substantial interest in the production a space launched vehicle (SLV). At first glance it would appear that Iraq's desire for a SLV would be for the eventual production of a Intercontinental Ballistic Missile (ICBM). Based on UN inspections, the speculation is that the Iraqi's desired the capability to launch satellites with real time intelligence capabilities. Iraq lacked this capability during both Gulf Wars. This argument is more believable when one looks at Israel's open desire for a satellite capability for intelligence purposes.⁵³

⁵² Navias, *Going Ballistic*, 49.

⁵³ Peter de Selding, "Israel Follows Slow Path Towards Early Warning Satellites" *Defense News*, 17 October, 1994.

D. CONCLUSION

Iraq has powerful incentives to acquire ballistic missiles. They are prestige weapons that demonstrate the technological sophistication of the countries that own them. More important than possessing them, however, Iraq's desire was to produce them indigenously. Such capabilities are a confirmation of modernity and a symbol of self-reliance. It would be a mistake, however, to say that missiles are only acquired for prestige. Ballistic missiles satisfy both military and political requirements as well. Missiles with WMD warheads serve as a formidable deterrent because of the fact that missile defense capabilities are far behind the capabilities of the missile systems. Given these strategic and tactical uses for ballistic missiles it is easy to see why Iraq and many other Third World nations desire missiles over equally capable weapon systems.

IV. IRAQ'S MISSILE PROGRAM: 1970-1990

In September 1981, Iraq invaded Iran, starting what was to become the seven-year Iran-Iraq War. At the outset of this war, Iraq was barely able to operate and maintain their mostly Soviet-made military equipment. By 1990, however, when Iraq invaded Kuwait, they possessed a military-industrial infrastructure whose size and technological sophistication rivaled those in many Western countries. Iraq's NBC and ballistic missile programs received particular attention during this time and undoubtedly saw the greatest transformation. By 1988 Iraq had the most ambitious WMD and ballistic missile program in the Third World, with the exception of China. Exactly how this relatively quick transformation took place in the face of seemingly effective and competent export controls and arms control treaties is the focus of this chapter.

Iraq's ballistic missile program involved four strategies.⁵⁴ First was the purchase of complete missile systems. This process centered around importing the SCUD-B missile systems from Russia. While the missile program revolved around the SCUD-B, Iraq also imported many other missile systems, including SAMs, ASMs and AAMs. These other systems allowed Iraq to gain valuable knowledge on all aspects of missile technology. Aside from purchasing complete systems, the Iraqis also purchased large amounts of missile production equipment striving for their ultimate goal of indigenous production.

⁵⁴ Information derived from interviews with UNSCOM inspectors or from the semi-annual UNSCOM reports from UNSCOM to the UN Security Council. The latest report used in this paper is dated 11 October 1996.

Iraq's second strategy was the modification, particularly range extension, of these missiles. Iraqi engineers had great success modifying the Soviet-made SCUD missile and they were able to more than double the range. The third Iraqi strategy was an attempt to reverse engineer SCUD missiles, striving for an indigenous production capability. More than 80 SCUD missile engines were produced by Iraqi engineers and attempts at other advanced equipment also proved successful.⁵⁵ The final strategy for Iraq's ballistic missile program was eventual indigenous production. In 1989, Iraq let it be known that it possessed a missile that could reach Europe and into parts of Russia. This threat worsened when the Western world learned that this missile was completely assembled, tested and deployed by Iraqi engineers.

A. IRAQI IMPORTS: BACKGROUND

Iraq emerged in the 1990's as the world's leading arms importer of the past decade with over \$63 billion (1990 dollars) in total purchases from 1980-1988.⁵⁶ Most of this value was supplied by the former Soviet Union, but Iraq's ability to pay for its large purchases with hard currency or through oil barter agreements made it an attractive target

⁵⁵ Allan George, "Iraq Reveals Capability to Manufacture SCUD Engine," *Flight International*, September 20, 1995, 19.

⁵⁶ Rachel Schmidt, et al., *Global Arms Exports to Iraq, 1960-1990*, (Santa Monica: Rand, 1991), 43.

for other countries as well. France, China, Brazil, Poland, West Germany, Bulgaria, Czechoslovakia and Italy were among its suppliers.⁵⁷

Iraqi imports during this period followed three major trends. First, during the 1960s, Iraqi imports increased dramatically; however, they were still somewhat selective towards the systems being purchased. Iraqi emphasis was still on weapons for its massive army, such as tanks, armored vehicles and personnel carriers, artillery pieces and small arms.

During the 1970s, Iraq increased its purchasing and pursued a policy of diversifying the countries from which it bought its weapons in an attempt to reduce the leverage that its suppliers could exert over it. Iraq imports now needed to include 'offsets', such as a level of training from the exporting nation as well as agreements for spare parts. It was during the mid-1970s that the Iraqis began importing SCUD-B missile systems.

During the 1980s Iraqi imports made the most dramatic change. Changes in Soviet policy in the mid-1970s and again in the 1980s made suppliers appear less reliable than Iraq would have liked. While Iraqi weapons acquisition philosophy continued with the purchase of complete systems, parts, training etc., it expanded to included the purchase of the production equipment itself. This change in philosophy was particularly evident in the purchase of ballistic missile production equipment from many European

⁵⁷ Total arms shipments to Iraq over the period of 1980-1988 averaged about \$7 billion annually (1990 dollars). The enormous deliveries to Iraq helped make the Middle East the largest arms-importing market throughout the 1980s, and Iraq was consistently the largest importing country in both the region and the world. See: Schmidt, *Global Arms*, 12, 43).

nations.⁵⁸ After Saddam Hussein's rise to power in 1978, Iraq saw dramatic increases in total imports as well as increases in the numbers of missiles and missile production equipment being purchased. Although this policy may have created a logistic nightmare for the Iraqi military infrastructure, it gave Iraq access to highly advanced military technologies in all areas of the defense industry. At times, these suppliers often competed against each other for a share of the Iraqi market. The end result was that Iraq obtained large quantities of state-of-the art weapons from a variety of suppliers.

Although a primary goal of the regime in Baghdad was to establish an indigenous ballistic missile program, at this point, the Iraqis were primarily missile importers and modifiers. Had the Gulf War not taken place most experts would agree that Iraq would have had an advanced domestic missile program as well as a successful nuclear weapons capability.⁵⁹ The increasing pressure to support international agreements, such as the MTCR, combined with the decrease of weapons supplied by the former Soviet Union, forced Iraq to become less dependant on others for their weapon systems. Establishing an indigenous ballistic missile program became not only a desire but a requirement for Iraq to reach its stated goals.

⁵⁸ For a complete list of companies named for providing direct assistance to Iraq's ballistic missile facilities, see: Anthony Cordesman, *Weapons of Mass Destruction in the Middle East* (London: Brassy's, 1991), 43.

⁵⁹ Mike Eisenstadt, "The Sword of the Arabs: Iraq's Strategic Weapons" Washington Institute Policy Paper no. 21 (Washington D.C.: Library of Congress), 40. Eisenstadt also discusses Iraq's extensive biological and chemical weapons programs.

B. IRAQI STRATEGIES FOR ACQUIRING BALLISTIC MISSILES

Similar to its nuclear weapons program, Iraq's ballistic missile program followed the philosophy of redundancy to ensure both success and security. Their goal was to build a competent, capable and indigenous missile production program by exploiting the competitive nature of the world export market and the increasing availability of ballistic missile technology. The Iraqi strategy for acquiring and developing a ballistic missile program consisted of four major elements. They are:

1. The purchase of missiles and missile technology;
2. The modification of Iraq's missiles;
3. Reverse engineering;
4. Domestic production.

1. Purchase of Missiles and Technology

Iraq has purchased hundreds of ballistic missiles since the mid 1970s and thousands of other missile systems.⁶⁰ As shown in Chapter III, the Iraqis had great demand for this sophisticated weaponry; however, they would not have been nearly as successful if it had not been for the willingness of foreign governments and companies to fulfill Iraq's needs.

⁶⁰ Sources put the total number of Iraqi missiles at 6,000 at the start of the second Gulf War. This included AAM, SAM, AShM, SSM and ASM.

a. *Purchase of Complete Missile Systems*

The first and probably most successful method for Iraqi acquisition of ballistic missiles was to purchase them from foreign governments. Iraq in the 1970s was an oil rich nation that had the cash to pay for these large purchases.⁶¹ The most important nations involved in such a relationship with Iraq were the Soviet Union, and Brazil.⁶² Unlike more sensitive items that required covert transfers, the Iraqis found that transfers of ballistic missile systems could be done, in effect, openly. There are three primary reasons for this lack of interest. First, these early missile transfers were conducted before the inception of the MTCR and, although not popular, were 'legal' and not a violation of any established international export guidelines. Second, the West feared that an Iraqi loss to Iran would cause great instability in the region and possibly upset the flow of Persian Gulf oil. Because of this the West often overlooked large Iraqi missile purchases. Lastly, these transactions took place during the height of the Cold War where the transfer of a relatively short-range ballistic missile system to a Third World nation that lacked a nuclear weapons capability was not seen as a serious threat.

A critical part of Iraq's missile program was their purchase of short-range artillery rockets. Although not categorized as ballistic missiles, these artillery rockets have proven to be the basis of the modern Iraqi missile program and continue to be an

⁶¹ The availability of almost unlimited financing was also crucial to the success of the Iraqi acquisition program. Covert operations, which were liberally used to obtain more problematic items, are by definition more expensive. Iraq often paid two or three times the value of the equipment because of its sensitivity.

⁶² Timmerman, *Death Lobby*, 147.

important part of their program today. Originally purchased from Brazil in the late 1970s, the ASTROS 2 rocket had a maximum range of 68 kilometers. The Iraqis almost immediately copied this rocket and were able to produce the ABABIL 50 and 100, with a range of 50 and 100 kilometers, respectively.⁶³ Working with artillery rockets gave the Iraqis a cheap experimental rocket with which to gain the valuable knowledge needed for the production of longer range systems. The ABABIL 50 and 100 proved useful as a tactical weapon when used to support the Iraqi invasion of Iran in 1981.

The next major missile system obtained by Iraq was the Soviet made FROG-7 missile. Between 1970 and 1988 the Soviets supplied Iraq with several hundred FROG-7 missiles. Just like the ASTROS 2 rocket, the Iraqis soon produced an improved version of the FROG-7 called the LAITH 90. At 9.1 meters in length, a weight of 2300 kilograms and a range of 90 kilometers, the LAITH 90 was used by Iraq to begin experimenting with different warheads like cluster bombs, fuel-air explosives and chemical agents.⁶⁴

In 1974, Iraq began purchasing SCUD-B missiles from the former Soviet Union. Although, the total number of SCUDs purchased by the Iraqis is not known, best estimates put the number at around 800.⁶⁵ A relatively short-range system with limited accuracy, the SCUD-B was to become the backbone of the Iraqi ballistic missile program.

⁶³ Carus, *Ballistic Missiles* 41.

⁶⁴ Martin S. Navias, *Going Ballistic: The Build-up of Missiles in the Middle East*, (London: Brassey's 1993), 22.

⁶⁵ UNSCOM missile inspectors put the total number at 819.

As Iraq continued to purchase short-range missiles, their desire for a longer range system increased. In 1986, Baghdad reportedly sought to purchase the more advanced Soviet-made SS-12 missiles, which had a range of 560 miles. The Soviets feared exporting missiles with long-range, especially to an unstable nation like Iraq, which had shown the ability and desire to modify the missile and increase the range. Therefore, the request was denied and more Scud-Bs were delivered in their place. By 1988, the Iraqis had purchased over 800 SCUD-B missiles from the Soviet Union. The SCUD-B missile became the workhorse of the Iraqi missile program and, once modified, became an important, if not decisive factor in the Iran-Iraq War. The modified SCUD-Bs also played a significant role during the second Gulf War.

In addition to the hundreds of surface to surface missiles purchased during this time, Iraq also purchased thousands of surface-to-air and surface-to-ship missiles from the Soviet Union. Similar to the modifications of the FROG-7 and the ASTROS 2 SSMs, Iraq quickly worked to redesign these missiles into SSMs.

b. Acquisition of Missile Technology

Exactly how Iraq acquired missiles and technology took many forms. At the overt level, Iraq purchased hundreds of missiles from the Soviet Union, however, the education and training of Iraqi engineers and scientists in other countries has proven to be as important as the transfer of the systems themselves.

At the covert level, this strategy involved the sales of missiles or related parts and technology that "public disclosure would prove embarrassing or dangerous for

both nations and possibly lead to international reprisals such as sanctions."⁶⁶ Here, the nations most notably involved were firms from Eastern Europe (particularly Germany), the United States and Latin America.⁶⁷ These covert transfers are thought to be more likely in the future with the increasing pressure of international export controls and the MTCR. The likelihood of these covert transfers will probably expand to new developers and exporters of ballistic missiles, such as North Korea, or from nations who practice a policy of selective enforcement of the MTCR such as Russia and China.⁶⁸

During the 1980s Iraq set up an enormous world-wide procurement network to obtain these weapons as well as spare parts and other equipment. In addition to missile technology, this network was created to obtain nuclear, biological, chemical (NBC) weapons technology. One important example involving this network was Iraq's front companies set up in Great Britain. The two most important front companies purchased by Iraq were the Technology and Development Group (TDG) and Meed International. TDG was set up by Dr. Safa al-Habubi, an Iraqi engineer and former head of the Nasr State Establishment for Mechanical Industries. TDG's most important action was the purchase of the British machine and tool company, Matrix Churchill. Ownership of these companies enabled Iraq to obtain the necessary technology for its WMD programs that

⁶⁶ Mark H. Kagan, "Iraq's Case: The International Trade and Proliferation," in William C. Potter and Harlan C. Jencks, eds., *The International Missile Bazaar: The New Suppliers Network*, (Boulder: Westview Press, 1994), 187.

⁶⁷ Timmerman, *Death Lobby*, 148. Germany being the largest contributor.

⁶⁸ The most recent example of this are the reports that China is assisting Pakistan in building a ballistic missile factory for the production of the M-11 missile.

it otherwise would not have had access to. It was determined in 1992 that the British government became fully aware of the ongoing Iraqi procurement network and that they allowed it to continue for three reasons. The first was purely economic. The British Trade Department did not want to lose Matrix Churchill's share of the Iraqi arms market. Secondly, the British counterintelligence agency was using Matrix Churchill as a means of acquiring intelligence on Iraq's global procurement network as well as intelligence on Iraq's entire weapons programs. Third, although two Matrix Churchill employees did go to jail, the British government wanted to avoid the embarrassment associated with uncovering the entire network. Meed International was set up by an Iraqi national, Anis Mansur, and a British national, Roy Ricks, and was instrumental in enabling the Iraqi's to import ballistic missile production equipment.⁶⁹

Quite often, however, the Iraqis found that they did not have to resort to these methods as the international community, including the U.S., often looked the other way or even aided in such transfers. For example, between 1985 and 1988, the U.S. Bureau for Export Administration in the Department of Commerce, approved hundreds of export licenses for shipments of dual use and military equipment to Iraq, with a significant percentage going to Sa'ad 16 for their ballistic missile program. "In May 1985, an American firm sought to export electronic equipment, including 18 Ghz electronic counters and six 275 Ghz oscilloscopes. In December 1985, the U.S. based Wilton Company sought to export 10 MHZ-40 Ghz scalar network analyzer system. In

⁶⁹ See "Iraqi Arms Purchasing: A Network in Europe Revealed," *Middle East Markets*, 18 September 1989, or Alan George, "Iraq's London Procurement Fronts," *Defense*, December 1989.

June 1987, another U.S. company sought to export 19.9 Mbit computer system for process control and data evaluation. All of the above items are used in the design or production of American missiles and were approved for sale to Iraq without condition."⁷⁰

Iraq also spent lavishly on consulting fees, salaries and benefits for the hundreds, perhaps thousands, of foreign engineers, scientists, technicians and workers whom they recruited for their military industrial complex. The MTCR, as an agreement that attempts to control the supply of missiles and related technology, does not adequately address the spread of information or the "proliferation" of trained personnel. Many of the Iraqi scientists and engineers were trained in the top universities in Western Europe, the United States and the former Soviet Union. "In an interview on 60 Minutes in November 1991, David Kay, then with the International Atomic Energy Agency (IAEA), said that some "world class physics" had been conducted in Iraq in their WMD and ballistic missile programs."⁷¹

Today, it is believed by most that only a handful of Iraq's ballistic missiles, launchers and missile production equipment remain.⁷² There is little that the international community can do to limit the pool of highly trained personnel that came so close to making Iraq a nuclear power with an advanced ballistic missile, biological and chemical

⁷⁰ Kagan, "Iraq Case" 189-190.

⁷¹ Ibid.

⁷² UNSCOM estimate.

warfare programs. It is this technical expertise and operational experience that Iraq still possesses.

This covert procurement network combined with Western nations turning their backs, allowed Iraq to obtain some of the most technologically advanced weaponry in the world. Although longer range missiles were withheld from Iraq, the missiles that were supplied, combined with the training received by Iraqi scientists and engineers, enabled their missile program to become extremely advanced in a relatively short time. This aggressive missile program combined with an equally aggressive NBC program added to the increasing instability in an already volatile region.

c. Construction of Missile Production Facilities

Iraq transitioned from missile purchasers to missile producers in only ten years. Iraq's change in emphasis from complete missile systems to missile production equipment was a significant change and ultimately alerted the developed world to the problem of ballistic missile proliferation in the Third World. In Iraq, ballistic missile production originally fell under the authority of the State Organization for Technical Industries (SOTI), which was run by Husayn Kamil Hassan, Saddam Hussein's son-in-law. Kamil Hassan expanded the size and functions of the SOTI, which soon combined with the Ministries of Industry and the Military Production Establishment to form the Ministry for Industry and Military Industrialization.⁷³ Subordinate to this was the Technical Corporation for Special Projects (TECO), which played an important role in missile

⁷³ Timmerman, *Death Lobby*, 290.

production. Kamil Hassan remained in overall charge as Saddam Hussein kept missile production close to the family, thereby indicating the importance he attached to it.

The Austrian and German engineering company Consultco was primarily responsible for the construction of the massive ballistic missile production facility called Sa'ad 16.⁷⁴ Located just outside the Iraqi city of Mosul and covering over 40,000 square meters, Sa'ad 16 was the center for Iraq's research, design, modification, testing and production for most of Iraq's missile inventory. Sa'ad was also where Iraq tested the use of chemical and biological warheads for their ballistic missiles.⁷⁵ The facility reportedly cost the Iraqi's \$200 million and construction was completed in 1989.⁷⁶

Other ballistic missile production facilities were located at Falluja (Project 073), a rocket production facility at Mahmudiya (Project 096), and a missile test area near Karbala (Project 1157).

2. Modification of Existing Missiles

Although the Iraqis were able to produce domestic versions of short-range rockets such as the ABABIL 50 and 100, as well as the LAITH 90, the Soviet SCUD missiles became the building blocks for the Iraqi ballistic missile program. During the 1980s, due to strategic requirements of the war, Baghdad began a rigorous effort to modify their

⁷⁴ Consultco is part of a large group of European companies based in Switzerland. Better known as the Consen Group, this group of defense related companies served as the prime contractor to all of Iraq's defense needs.

⁷⁵ See: "Sa'ad 16: Iraq's Military 'Business Park'," *Middle East Markets*, 15 May 1989.

⁷⁶ Mike Eisenstadt, *Sword of the Arabs: Iraq's strategic Weapons*, 22.

SCUD missiles in order to be able to engage targets within Iran, particularly Tehran. Iraq's modified missiles experienced limited success until 1987, when the first modified SCUDs were used. After 1987, however, these missiles proved successful against Iran and alerted the rest of the world to the problem of ballistic missile proliferation.

a. AL HUSSEIN

Iraq's AL HUSSEIN missile is a modified Soviet-made SCUD-B missile. First reported in mid-1987, the AL HUSSEIN, or Project 144, is believed to be capable of carrying conventional or chemical warheads. The greater range of the AL HUSSEIN was apparently achieved by reducing the size of the warhead from 800 to 190-500 kilograms and increasing the fuel capacity by over 20 percent.⁷⁷ The AL HUSSEIN appears to use modified SCUD guidance technology as the missile is said to have a CEP of 500 meters, half that of the unmodified SCUD-B.⁷⁸ During the Iran-Iraq War, Iraq fired over 300 modified SCUDs, most of which were believed to be AL HUSSEIN's.⁷⁹ It is reported that Iraq fired between 80 and 90 AL HUSSEIN's during the second Gulf

⁷⁷ James E. Nolan, *Trappings of Power: Ballistic Missiles in the Third World*, (Washington, D.C.: The Brookings Institute, 1991), 55.

⁷⁸ CEP is defined as the circular error probable. If a missile has a CEP of 1 kilometer then the probability is that one-half of the missiles fired at a target will land inside a circle centered at the intended impact point and having a radius of 1 kilometer. The exact range and accuracy of the modified SCUDs is highly debated and can vary from missile to missile.

⁷⁹ Carus, *Ballistic Missiles* 37.

War. Of these, at least 43 were fired at Saudi Arabia, and a minimum of 38 were fired at Israel.⁸⁰

b. AL ABBAS

The AL ABBAS appears to be an improved version of the AL HUSSEIN, having a longer range than the AL HUSSEIN, but the same payload. The increased range was apparently gained by increasing the capacity of the existing AL HUSSEIN propellant tanks. Range estimates are between 800 and 950 kilometers. Iraq claims that the AL ABBAS has a CEP of 500 meters, however, U.S. missile experts feel that this is probably exaggerated.⁸¹ Although the first flight tests of the AL ABBAS were reported in 1988, it is understood that no AL ABBAS missiles were fired during the second Gulf War.

c. AL FAHAD

Another project which the Iraqis undertook was the modification of surface-to-air missiles to short-range surface-to-surface missiles. These first came to the attention of Western observers at the 1989 Baghdad International Exhibition of Military Production. The AL FAHAD is a modified SA-2, able to be fired as a surface-to-surface missile.

d. AL ABID

On December 14, 1989, the Iraqi's reported the test of a satellite launcher missile. Baghdad reported that the AL ABID consisted of three stages, weighed 48 tons,

⁸⁰ Jane's, *Strategic Weapons* 1996, 27.

⁸¹ Jane's lists the CEP for the AL HUSSEIN missile at 2000-3000 kilometers.

was liquid fueled and was 25 meters long.⁸² Although public statements claimed that Iraq desired to put reconnaissance satellites into orbit, most Western analysts felt that their objective was to merely show the ability to launch such a missile or perhaps to experiment with intermediate-range ballistic missiles. The AL ABID consisted of a first stage of 5 AL HUSSEIN missile and a second stage consisting of five Soviet-made SA-2 SAMs. The second stage later proved to be inoperative. The start of the Gulf War in 1991 cut this project short and its termination remains a primary goal of UNSCOM.

e. TAMMOUZ I

The TAMMOUZ projects could be called Iraq's most threatening project and the one with the most potential. Meant as a signal to Israel and Iran, the TAMMOUZ missile had a possible range of 2000 kilometers and with most Iranian and Israeli targets within 1000 kilometers, the TAMMOUZ could also have been meant to also threaten targets beyond the Middle East. Some analysts speculate that this missile was meant to hit Iranian naval bases at Bandar Abbas. As a SSM, this missile could reach Moscow, Paris and even London, and would have been of great concern to all nations in Europe. Because the TAMMOUZ is simply a AL HUSSEIN first stage and a SA-2 second stage, the United Nations has destroyed all declared AL HUSSEINS and has tagged all declared SA-2's

⁸² Jane's, *Strategic Weapons*, 1996, 27.

f. AL HIJARA

Iraq also modified its missile warheads as a means of improving its missiles. Some modifications included the use of high explosives, chemical and biological weapons and fuel-air explosives. During the second Gulf War, Iraq also fired AL HUSSEIN missiles filled with a concrete warhead, called the AL HIJARA, and meant "earth penetrator" or "kinetic warhead" in Iraqi parlance. This type of warhead caused much greater fragmentation and was able to inflict greater damage on Israeli and Saudi Arabian cities.

g. AL WHALEED

The Iraqis also developed their own domestic variant of the mobile SCUD-B launcher known as the AL WHALEED. It is not clear how much this was modified from the Soviet TEL (Transporter, Erector and Launcher). It is believed that there are still several AL WHALEED's remaining in Iraq.

3. Reverse Engineering

The ability to reverse engineer a complicated weapon system, such as a ballistic missile, requires an advanced knowledge of engineering and ballistics. By 1991, the Iraqis were able to reverse engineer at least 80 SCUD engines.⁸³ This effort, part of Project 1728, was disguised as a welding school and was far more successful than most missile experts had thought. Although the Iraqi engineers had significantly more trouble

⁸³ Allan George, "Iraq Reveals Capability to Manufacture SCUD Engine," *Flight International*, September 20, 1995, 19.

with other complex parts, such as turbo pumps and guidance components, they showed tremendous potential to reverse engineer many other systems. In addition to SCUD engines, the Iraqi's also began a program to reproduce SA-2 engines to be used in intermediate range systems.

4. Domestic Production

Aided by sizeable infusions of technology from all over Europe, the Iraqis succeeded in purchasing thousands of complete missile systems. They also proved capable of modifying these missiles to meet certain operational necessities. Although successful at reversing engineering, the Iraqi's eventual goal was the domestic production of ballistic missiles.

The first missile domestically produced within Iraq was the ABABIL 50 and ABABIL 100, a modified Brazilian made ASTROS 2 artillery rocket. Next was the LAITH missile, the Iraqi version of the FROG-7 Soviet-made missile, followed by the AL HUSSEIN and the AL ABBAS. Although these are considered indigenously produced, they were all Iraqi modifications of imported missiles.

a. BADR 2000

The first true domestic project was the BADR 2000. This missile was ultimately designed to be a two-staged missile having a range of 900 kilometers and a warhead weight of 500 kilograms. Designed to be a solid fuel missile for the delivery of nuclear warheads or fuel air explosives, the BADR 2000, also known as the CONDOR II, became the focus of a great deal of international media and global government

attention. The complexity and sophistication of the missile required the assistance of Argentina and Egypt.⁸⁴ This cooperation began in 1984, when Iraq agreed to finance the program, Egypt agreed to secure the technology and engineers from Argentina and Iraq would produce the missile. Western pressure, primarily American, slowed the project during the late 1980s. This led to the withdrawal of both Argentina and Egypt from the project in 1990. Western analysts predicted the end of the project, stating that Iraq did not possess the infrastructure to support such a program, however, UN inspections after the Gulf War showed that testing of a solid fuel missile, believed to be the BADR 2000, had continued throughout the War. This indicates that Iraq intended and attempted to continue the program unilaterally.

C. CONCLUSION

As Iraq's global arms imports demonstrate, liberal arms exports policies can have unintended consequences. The broad global competition for arms sales enhanced Iraq's military capabilities. U.S. and Coalition forces later faced those capabilities in the Persian Gulf War. In the future, arms exporting nations must balance the benefits derived from weapons sales against the risk that they might have to fight an importer, such as the Hussein regime.

Iraq's advances in its missile program, particularly in its ability to reverse engineer and domestically produce complicated weapons systems is a global wake-up call: Third

⁸⁴ Navias, *Going Ballistic*, 104.

World ballistic missile programs must not be underestimated because doing so would ignore the greatest security threat of this decade.

The Iraqi programs showed the level of success a determined and resourceful proliferator can achieve. Although export control laws were in place, the Iraqis were able to acquire any military technology they desired. If not for Saddam's invasion of Kuwait and the decisive response of the United States and the rest of the international community, Saddam Hussein probably would be the ruler of a nuclear weapons capable state with the missile capability to reach Europe and Asia.

V. U.S. AND UN EFFORTS TO COUNTER IRAQ BALLISTIC MISSILE PROLIFERATION

Mobile missile hunting was difficult and costly; we will need to do better.
Secretary of Defense, Richard Cheney

On January 17, 1991, Iraq responded to Coalition air attacks by launching the first of 88 SCUDs from mobile missile launchers. The missile impacts in Israel dramatically demonstrated the link between politics and war. A missile labeled 'militarily insignificant' by U.S. commanders threatened to undermine the international coalition assembled to eject Saddam Hussein's forces from Kuwait.

Subsequent to Iraqi missile launches, the coalition commanders were forced to divert resources to counter this 'insignificant' threat. This 'SCUD hunt' continued for the duration of the war and experienced limited success, at best. After Operation Desert Storm, the United Nations formed a Special Commission whose orders were to locate and destroy Iraq's ballistic missile and WMD production capability. This chapter assesses the efforts required to prevent proliferation and production of ballistic missiles in Iraq. Specifically, this chapter addresses the efforts of Coalition forces against Iraq's ballistic missiles and the efforts of UNSCOM in the form of inspections, monitoring and destruction of Iraqi facilities.

A. U.S. EFFORTS TO COUNTER IRAQI MISSILE PROLIFERATION

Unlike the slowly unfolding picture of V-1 and V-2 development that the Allies witnessed during World War II, the U.S. and Coalition commanders knew that Iraq had, and was willing to use, ballistic missiles. Iraq had already demonstrated the ability to use missiles in combat and had also showed a willingness to use chemical weapons.⁸⁵ Observation from the Iran-Iraq War provided a useful but limited amount of information about Iraq's missile capabilities. Coalition intelligence planners had two major problems:

1. The number of missiles and launchers that Iraq possessed and their capabilities; and
2. How Iraq would employ the missiles against the coalition.⁸⁶

Coalition efforts to counter the Iraqi ballistic missile threat consisted of two major strategies. First was the use of the Coalition air forces to locate and destroy Iraqi fixed missile sites. Although somewhat successful, the air forces could only destroy SCUDs from fixed sites after a launch has taken place. Second was the use of Special Operations Forces to assist in locating Iraqi mobile launchers and attempt to destroy Iraqi missiles before being launched. SOF also experienced limited success.

⁸⁵ Iraq used chemical weapons against Iran in 1987, but they used aircraft and artillery as delivery systems, not ballistic missiles. U.S. military planners assumed that if the Iraqis could not use their aircraft due to Coalition air superiority, that ballistic missiles would be the delivery system for these unconventional weapons.

⁸⁶ Much of the information on coalition efforts against Iraqi missiles is derived from Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey, Summary Report*, (Washington, D.C.: Library of Congress, 1993) or the long report of the same name, vols. 1-6.

1. The Coalition Air Campaign

In the first days of the air campaign, the Coalition attacked all 25 known fixed SCUD sites. Twelve were destroyed and the other thirteen were damaged.⁸⁷ The intent of the coalition air strikes was to suppress SCUD launches at Israel, Saudi Arabia and the other Gulf nations. These efforts quickly ran into problems. For example the presurveyed mobile launch sites and hiding places had not been identified before the air war started on 17 January 1991.⁸⁸ Much like the Allied commanders who had ignored the V-1 missile sites in World War II, Coalition commanders in the Gulf War similarly ignored mobile launchers until they started launching their SCUDs on the first night of the War. Stopping the SCUDs depended on airpower destroying the known fixed launch sites, facilities and storage bunkers, maintaining a 24-hour SCUD combat air patrol (CAP) to find and destroy the mobile launchers, and conducting armed reconnaissance to locate and destroy SCUD equipment and facilities.⁸⁹

Approximately 1,500 sorties were flown over 43 days against such SCUD targets as mobile missile launchers, suspected hiding places, and the production and storage facilities.⁹⁰ Fifteen percent of the Coalition air campaign was dedicated to finding and destroying SCUD launchers and the overall air campaign took 39 days, nine days longer

⁸⁷ Tim Ripley, "Destroying Iraq's Ballistic Missiles," *Jane's Intelligence Review* 4, no. 10, (October 1992): 27.

⁸⁸ Keaney and Cohen, "Gulf War", 83.

⁸⁹ GWAPS, vol. 5, 545.

⁹⁰ Keaney and Cohen, "Gulf War," 83-84.

than planned. The authors of the Gulf War Air Power Survey (GWAPS) considered the SCUD hunt one of two significant diversions from the planned executions of the air campaign.⁹¹ Coalition planners had anticipated that Iraq might attack Israel with SCUDs, but planned to bomb only the known fixed sites. The most threatening fixed sites were near H-2 and H-3 airfields located in Western Iraq and were attacked during the first night of the air campaign. The pressure from Washington to destroy the SCUDs was tremendous, as President Bush wanted to keep the Israelis out of the war at all costs.⁹² To achieve that objective, anti-SCUD operations were a top Coalition priority.

SCUD hunt tactics essentially required aircraft to orbit over the known general area of the mobile SCUD launchers, ready to strike when the SCUDs were discovered. A variety of aircraft took part in the effort, including Airborne Warning and Control System (AWACS), Joint Surveillance Target Attack Radar System (J-STARS), F-15Es, F-16s and A-10s. Ideally, the Coalition wanted to destroy the mobile SCUDs before they launched, but decoys, camouflage and clever Iraqi tactics thwarted this aim. Aircrews attempted to attack the sites immediately after launch (the crux of the SCUD Hunt), but time, distance and decoys, as well as noise (objects that could be mistaken for SCUDs), all worked against this goal. One F-15E crew visually witnessed a SCUD launch at night, and attempted to find the launcher, but could not.⁹³

⁹¹ GWAPS, vol. 2, pt.2, 100-101.

⁹² GWAPS, vol. 2, pt. 1, 184.

⁹³ Ibid., 187.

Iraq successfully fired 88 SCUDs during the war: 38 at Israel, 41 at Saudi Arabia, two each at Qatar and Bahrain. Seven broke up in flight. Over 40 percent were launched during the first week of the war.⁹⁴ The decline lends some credence to Air Force colonel John Warden's view that the sorties suppressed SCUD launches in subsequent weeks even if they did not destroy any TELs.

The Iraqis launched the majority of their SCUDs at night. Only three were launched during daylight hours, and these occurred in the early daylight hours under heavy cloud conditions.⁹⁵ Weather also aided the Iraqi SCUD efforts. Heavy cloud cover "precluded effective identification of SCUD locations from space and hampered the subsequent aerial hunt for SCUD launchers."⁹⁶ The inability to stop the SCUDs became a source of embarrassment to the United States government.

In the Pentagon daily briefings on the war, Defense Department officials constantly stressed that destroying the SCUDs was a top priority. When asked why the SCUDs continued to function despite this effort, General Kelly admitted, "It's a tough target. The mobile launchers can move and hide...Iraq is about 170,000 square miles...Every day we are trying harder to get those SCUDs, and sooner or later we're going to get them."⁹⁷

⁹⁴ W. Seth Carus, "Ballistic Missiles in the Third World," (New York, Praeger, 1991) 31.

⁹⁵ Bermudez, "Iraqi Missile Operations During 'Desert Storm'," 134.

⁹⁶ GWAPS, vol. 5, 543.

⁹⁷ W. Andrew Terrell, "The Gulf War and Ballistic Missile Proliferation," *Comparative Strategy* 11, no.2 (April-June 1992):168.

Excess airpower, in excess of requirements, allowed General Horner to 'bleed' off sorties to hunt for SCUDs. Because of the Coalition's large Air Force, the effect of SCUD hunting was mostly to delay attacks on other targets, but it did not alter the outcome of the war. Iraq was still forced out of Kuwait. Had Saddam been more effective in orchestrating a withdrawal from Kuwait or a cease-fire, the time and sorties used to hunt SCUDs might have allowed other targets to have escaped unscathed.⁹⁸

The sorties flown against the fixed launchers failed to suppress the SCUDs because the Iraqis used mobile launchers exclusively.⁹⁹ The fixed sites actually served as decoys and destroying them diverted planners attention away from the mobile launchers.¹⁰⁰ If the Coalition did not bomb the fixed sites, more SCUDs may have been launched. Yet, Coalition planners did not fully understand ballistic missile capabilities. Iraq made its missiles, by accident or design, as resistant and elusive to air attack as possible. The mobile SCUD decoys were so realistic that they could not be distinguished at 25 yards on the ground, much less in the air.¹⁰¹

The difficulty in pinpointing the mobile SCUDs made it impossible to confirm the destruction of any mobile launchers by Coalition aircraft. Obviously, many decoys and look-alikes were hit. Additionally, the maximum number of launches in any day during

⁹⁸ Terrill, "The Gulf War," 170.

⁹⁹ GWAPS, vol. 2, pt. 2, 331.

¹⁰⁰ Ibid., 333.

¹⁰¹ Ibid., 334.

the war never exceeded the number of mobile launchers known to have survived the conflict.¹⁰² Most, if not all, of the 100-plus mobile launchers claimed by Coalition aircrews and SOF were decoys or other vehicles.¹⁰³

According to Dr. Thomas A. Keaney, staff member of the *GWAPS* team and Chief of the *Gulf War Air Power Summary Report*, the SCUD threat was underestimated. It was considered militarily unimportant, but strategically it held the key to holding the Coalition together. Keaney asserts that Coalition aircraft probably suppressed the number of SCUD firings and degraded their accuracy, however, Iraqi missile attacks continued until the end of the war, including 21 hours before the cease-fire when an Iraqi SCUD hit an American barracks in Dahran, killing 28 soldiers.¹⁰⁴

2. Special Operations Force Ground Operations

Most information on U.S. SOF operations against SCUDs is classified. However, it is known that U.S. and British SOF units were involved in counter-SCUD operations. General Schwarzkopf mentions that Special Operations teams went deep into Iraq to watch the roads and report sightings of mobile launchers.¹⁰⁵ There is one mention of U.S. SOF involvement in operations against SCUD missiles in the 824-page Department of

¹⁰² Ibid., 330.

¹⁰³ GWAPS, vol. 2, pt. 1, 189.

¹⁰⁴ An AL ABBAS long-range missile apparently hit the barracks. "DSP's Detect Fatal SCUD Attack," *Aviation Week and Space Technology* 140, no. 14 (4 April 1994): 32.

¹⁰⁵ Schwarzkopf, 1992, 418.

Defense Report on the *Conduct of the Persian Gulf War*. It states that a key element in the counter-SCUD effort was small SOF elements on the ground who provided vital information about SCUDs.¹⁰⁶ Special Operations Forces claimed to have destroyed 11 mobile ballistic missile launchers; however, the GWAPS (later confirmed by UN inspectors) illustrates that this could not have been possible and that most launchers destroyed by Special Operations Forces were probably decoys.

3. "PATRIOT" Ballistic Missile Defense Systems

Attempting to destroy and deter Iraqi ballistic missile use, the United States deployed Patriot Missile Batteries to Israel, Saudi Arabia and Turkey.¹⁰⁷ Few can forget the televised images of the destruction of Iraqi SCUDs by Patriot missiles. Although designed to defend against aircraft, Patriot batteries proved to have some success against SCUDs during the Gulf War. The lack of mass SCUD attacks made it easier for the Coalition Patriot missiles to target and destroy them. A large attack might easily have overloaded the Patriot system.

Twenty-one Patriot batteries were deployed to Saudi Arabia to protect airfields, oil refineries, command and control centers and the combat divisions in the field.¹⁰⁸ Of

¹⁰⁶ DOD, 1992, 168.

¹⁰⁷ A Patriot battery includes up to eight launchers, each with four MIM-104 missiles and support equipment, including a phased-array radar, a weapons control computer, an electric power plant and communications equipment.

¹⁰⁸ Harry G. Summers, "Persian Gulf War Almanac," (Washington D.C.: Library of Congress, 1995), 212.

the approximately 600 Patriot missiles deployed, 158 were fired at 47 Iraqi SCUD missiles over Saudi Arabia and Israel. Hailed at the time as enormously successful, after the war the Patriot system came under intense criticism,¹⁰⁹ much of it motivated by fears that the success of the Patriot would promote further investment in the Strategic Defense Initiative (SDI) program to develop a defense against strategic ballistic missiles.¹¹⁰

B. UN EFFORTS TO COUNTER IRAQI MISSILE PROLIFERATION

In addition to Coalition efforts against Iraq, the United Nations was also essential in the fight against Iraq in three major areas. First, the United Nations played an integral part in condemning Iraq for its invasion by immediately placing economic sanctions after the invasion in August of 1990. Second, the United Nations was essential in forming the Coalition. Third, the UN remains an integral part in preventing the rebuilding of Iraqi military capabilities by continuing the sanctions and inspections despite substantial international pressure.

1. UN Sanctions

In August 1990, the United Nations Security Council placed comprehensive sanctions on Iraq under UN Resolution 661. Shocked by its brutal invasion of Kuwait, the U.S. led initiative was designed to:

¹⁰⁹ For a detailed examination of the value of the Patriot System see: Theodore A. Postol, "Lessons of the Gulf War Experience with Patriot," *International Security* 16, no.3 (Winter 1991/92):119-171.

¹¹⁰ Summers, "Persian Gulf," 213.

1. Devastate the Iraqi economy to force Iraq to withdraw from Kuwait;
2. Warn Iraq that the world community was united in its efforts to force Iraq to withdraw;
3. Weaken Iraq's ability to defend itself in the case that allied use of force is necessary;
4. Signal worldwide disapproval immediately while deciding on other actions.¹¹¹

These prewar sanctions led to a vigorous debate in the United States over the effect of economic sanctions. Many U.S. policy makers and high ranking military officers, including the Chairman of the Joint Chiefs of Staff, General Colin Powell, favored the continuation of economic sanctions before using military force.¹¹² As 1990 came to a close and Iraq's forces firmly in place in Kuwait, President Bush, with the support of Congress, abandoned the economic sanctions placed on Iraq and proceeded with Operation Desert Storm. Congressman Stephen Solarz wrote: "If six weeks of the most intense aerial bombing in history was not sufficient to bring about an unconditional withdrawal from Kuwait, it is simply not plausible to suggest that six more months of the relatively benign application of sanctions would have done so."¹¹³

The postwar economic sanctions placed on Iraq are far more complicated than those in place before the war. Member nations disagreed on the severity of the sanctions

¹¹¹ Patrick Clawson, "How has Saddam Hussein Survived? Economic Sanctions, 1990-1993," McNair Paper no. 22, (Washington, D.C.: INSS, August 1993), 3.

¹¹² Sam Nunn, "War Should Be a Last Resort," *Washington Post*, 11 January 1991.

¹¹³ "Don't Argue with Victory," *New York Times*, 18 March 1991.

and also disagreed on the circumstances necessary for lifting them. The main goals or intentions of the postwar sanctions are:

1. To keep Iraq from rearming;
2. To ensure full compliance with UN resolutions;
3. To end Saddam's rule;
4. To punish Iraq.¹¹⁴

The most ambitious goal of the sanctions is to keep a tight arms embargo on Iraq to prevent rearmament. This is particularly true with regard to Iraq's unconventional weapons programs. The sanctions regime has achieved much success, however, Kenneth Timmerman has proven that Iraq has been able to rebuild much of its military industries.¹¹⁵

2. United Nations Special Commission to Iraq

In the aftermath of the Gulf War the UN Security Council sought to ensure that a defeated Iraq would never again pose a threat to regional and international security. To this end, UN Security Council Resolution 687 mandated the dismantling of Iraq's weapons of mass destruction and ballistic missiles with a range of greater than 150 kilometers.¹¹⁶

¹¹⁴ Clawson, "How has Saddam," 7.

¹¹⁵ Kenneth Timmerman, "The Remilitarization of Iraq," *The Nonproliferation Review* 1, no.2 (Fall 1993): 32.

¹¹⁶ Jonathan Tucker, "Monitoring and Verification in a Noncooperative Environment: Lessons From the UN Experience in Iraq," *Nonproliferation Review* 3, no. 3 (Spring-Summer 1996), 1.

To implement this program of forced disarmament, the Security Council established the United Nations Special Commission on Iraq (UNSCOM). An especially challenging aspect of UNSCOM is that they not only deal with non-nuclear WMD, such as internationally banned biological and chemical agents, the IAEA is tasked with nuclear inspections and monitoring, UNSCOM must also limit their means of delivery. The tasks related to ballistic missiles are complicated by the fact that the ban is not total (only missiles with ranges exceeding 150 kilometers are prohibited).¹¹⁷

UNSCOM has unprecedented rights and privileges to inspect and monitor Iraq's military and civilian industry. Both the sanctions and inspections, however, are merely short-term solutions to a long-term problem. If UNSCOM's successes are to become an example of future arms control efforts, it is important to learn all possible lessons from this case.¹¹⁸

UNSCOM missile inspections, although ultimately successful, have been plagued with trouble and controversy. Iraqi responses to UN missile inspections have caused substantial mistrust between UNSCOM inspection team leaders and Iraqi counterparts. Some Iraqi tactics to hinder UN missile inspectors are:

1. To make incomplete and misleading declarations to inspectors in an attempt to lead them away from sensitive sites;

¹¹⁷ Tim Treven, "Ongoing Monitoring and Verification in Iraq," *Arms Control Today*, May 1994, 11.

¹¹⁸ Kathleen Bailey, *The UN Inspections in Iraq: Lessons for On-Site Verification*, (Boulder: Westview Press, 1995), 1.

2. To intimidate UN inspectors by confronting them about certain sites;
3. To gain intelligence about intended missile inspection sites by engaging in intensive surveillance operations against inspectors by bugging hotel rooms and offices used by UNSCOM, monitoring of UN radio frequencies and even infiltrating UNSCOM's Baghdad field organization,¹¹⁹
4. Destruction of evidence; and
5. Impeding inspections by stalling or denying entry to a site.¹²⁰

To date, UN missile inspectors have conducted over 40 official missile inspections and countless day-to-day inspections by UN personnel that remain in Iraq as part of the monitoring regime. A majority of the inspections have been pre-planned, while several have been no-notice inspections of suspected sites. Estimates of the number of remaining Iraqi surface-to-surface missiles with a prohibited range of greater than 150 kilometers is as low as ten and as high as 85.¹²¹ While referring to Iraqi ballistic missiles that are unaccounted for, UNSCOM chief Rolf Ekeus stated: "We cannot verify that Iraq does not possess long range missiles or components...We have information and data which contradict that."¹²² Iraq has admitted to hiding missiles from inspectors in the past, but have stated that all Iraqi SSMs have been destroyed.¹²³

¹¹⁹ Exposed after the defection of Lt. Gen. Hussein Kamel.

¹²⁰ Tucker, "Monitoring and Verification," 5-9.

¹²¹ "Iraq fails to account for SSMs," *Jane's Defense Weekly*, 30 October 1996, 3.

¹²² "Iraq still conceals data on its weapons." *Executive News Service*, 21 October 1996.

¹²³ *Ibid.*, 1.

3. Observations

With over five years of "anytime, anywhere" inspections, the West is still convinced that Iraq maintains a portion of its surface-to-surface missiles as well as CBW. As shown in the next chapter, this equipment is of little threat. As international support for the economic sanctions continues to subside, so too will the ability of UNSCOM to conduct its inspections. Unprecedented in nature, the efforts of the United Nations have proven to be essential in limiting Iraq's ability to rebuild its armed forces. This case has also shown that international support and agreement is required for effective inspection and monitoring of a defeated nation. As Kathleen Bailey puts it, "Unless the international community is as politicized and committed as it is in the case of Iraq, such a culprit may escape ramifications even if violations are strongly suspected."¹²⁴

C. CONCLUSION

The efforts of the United States and the United Nations have been instrumental in countering Iraqi missile proliferation. Yet three key lessons need to be learned. First, because the United States and the rest of the Western world ignored and at times aided or encouraged Iraqi proliferation and aggression, a preventative war was necessary to contain Saddam. Secondly, Coalition planners failed to understand or properly defend against Iraq's ballistic missiles. Third, the efforts of the United Nations and, specifically

¹²⁴ Bailey, *The UN Inspections*, 109.

UNSCOM, are necessary, but not sufficient to limit the proliferation of ballistic missiles.

Learning from these lessons is essential to preventing another Iraq-like experience.

VI. IRAQ'S BALLISTIC MISSILE PROGRAM AFTER 1992

United Nations Security Council Resolution 687 prohibits Iraqi possession of ballistic missiles with a range of over 150 kilometers and also prohibits Iraq's possession of missile production equipment and related technology capable of being used in such missiles. Nevertheless, the United States believes Iraq has hidden a small number of mobile launchers and several dozen SCUD-type missiles produced before Operation Desert Storm.¹²⁵ Consequently, the international community has formed an elaborate inspection and monitoring system to limit future Iraqi proliferation of ballistic missiles.

The monitoring regime currently in place to limit Iraqi proliferation involves three major areas. First is the on-site inspections currently being conducted by the Special Commission. Second is the utilization of sensors and cameras to monitor Iraq's WMD programs. Third is the process of tagging sensitive equipment to allow UNSCOM inspectors to monitor the location or use in WMD related projects.¹²⁶

Since 1992, Iraq's ballistic missile program has revolved around three specific areas. First are the systems that Iraq currently employs. These involve three short-range systems and the potential modification of several SAMs and cruise missiles. Second is the research and development programs of several systems that Iraq could someday

¹²⁵ Office of the Secretary of Defense, *Proliferation: Threat and Response*, (Washington, D.C.: Government Printing Office, 1996), 24.

¹²⁶ Information on Iraq's current and suspected programs have been derived from interviews with UN weapons inspectors.

employ, including one major program based on the SA-2 propulsion system. Several missiles in this category could exceed the 150 kilometer limit set by the UN. Lastly are the missile systems that Iraq could employ given its pre-Gulf War resources. Although speculative, this section illustrates potential scenarios that could lead to Iraq's possession of intermediate- or long-range ballistic missiles.

The essential problem that this chapter addresses is that the technology and equipment used in the production of missiles with a range of less than 150 kilometers is in many cases similar to the equipment used in the development of intermediate- and long-range missiles. Examining Iraq's current short-range systems, and systems currently being researched, it is feared that Iraq possesses the expertise necessary for longer range systems.

A. IRAQ'S DECLARED MISSILE SYSTEMS

Iraq's current missile system is defined as the missiles that are currently in the Iraqi inventory and capable of being employed. Revolving mainly around three systems, all with a range of 90 kilometers or less, Iraq maintains an impressive inventory of missiles.

First is the LUNA or the Soviet-made FROG-7 missile. Although possessed in large quantities, the LUNA is a short-range system (70 kilometers) and has limited potential for range extension. UN missile inspectors feel that the Iraqis could perhaps extend the range of the LUNA perhaps ten to fifteen percent, at best, and that this missile is not a major concern.

The second system currently being employed by Iraq is the Brazilian-made ASTROS II. Limited in number, the ASTROS II has a range of 60 kilometers and has limited potential for range extension. Although monitored by the United Nations, this system serves little threat to Iraq's neighbors and, like the LUNA, is not a future concern.

The third system relevant to this discussion is the Iraqi modification to the Russian-made SA-2 and SA-3 surface-to-air missiles. Although not a SSM, the Iraqis are aware of the ability of the Chinese to convert these systems into SSMs.¹²⁷ This was displayed in the Iraqi pre-Gulf War programs to modify the SA-2 to a surface-to-surface missile. These systems have potential for use as a SSM and for range extension. Like the LUNA and FROG-7 missile, the unmodified SA-2 and SA-3 missile poses little threat to Iraq's neighbors, however, the potential modification for these systems does create cause for concern and this threat is discussed in detail in the next section.

The final group of missile systems currently being employed by Iraq are the inventory of Russian and Chinese made air-to-ground and anti-ship cruise missiles. All purchased before the second Gulf War, these systems are all older generation missiles that can be used as a SSM, but have little potential for significant range extension. Although not a specific proliferation problem, and little threat to Iraq's neighbors, these missiles do provide the Iraqis some level of military utility. These systems have all been tagged by UN inspectors and their location is closely monitored.

¹²⁷ OSD, *Proliferation: Threat and Response*, 24.

Iraq's currently deployed missile systems pose little threat to neighboring countries and receive systemic, though not critical, UNSCOM attention. The threat of Iraq's ballistic missile programs lies in the systems currently being researched and developed. Although UNSCOM has conducted many inspections attempting to limit Iraq's missile programs, they are unable to halt the systems being researched due to the inherent restrictions of UNSCR 687.

B. SYSTEMS CURRENTLY UNDER RESEARCH AND DEVELOPMENT

The most serious threat from Iraq's missile programs is from the systems that are in the process of being developed. The ability to contain Iraq's future missile capabilities lies in the assumption that the UN sanctions and UNSCOM inspections will not go on forever. Once the economic sanctions and inspections have been lifted, it is believed that Iraq will continue to pursue the systems that are currently being designed by Iraqi engineers.

The major program currently being researched is a process reviving the ABABIL 50 and ABABIL 100 program. The ABABIL 50 is an artillery rocket currently being produced in limited numbers and serves as an extremely short-range but fairly accurate missile.¹²⁸ The ABABIL 100, however, is currently making the greatest transformations. With a larger airframe, this missile is in the development process with both solid and

¹²⁸ CEP of less than 500 meters.

liquid propellant versions being considered.¹²⁹ The range of the ABABIL 100 runs dangerously close to the 150 kilometer limit and has the potential to be extended much further. This ability to improve these missiles presents the greatest threat to neighboring countries. Based on SA-2 technology, this missile has tremendous potential as was shown by other Iraqi missiles that used SA-2 engines.

The FAHD 300/500 first showed the Iraqi's the capability of the SA-2 as a SSM. Next was the CONDOR II program that used SA-2 engines as its second stage. The most threatening use of SA-2 technology occurred when the Iraqi's designed an SA-2 engine as the third stage of the AL ABID space launch vehicle or as the second stage of the 2,000 kilometer TAMMOUZ ballistic missile. Although these systems were never seriously tested, they clearly illustrate the intended path the Iraqis hoped would bring them an intermediate-range ballistic missile.

The AL ABABIL 100 program is also known as the AL SAMOUD, Arabic for "to fight against". For the Iraqis, this program serves as an example of how they can fight against the entire international community. The ability to reverse engineer the SA-2 engine is of great concern to UNSCOM, and the inspecting and monitoring of this R&D program consumes much of UNSCOM's time and effort in the missile area.

¹²⁹ Ibid., 24.

C. PROLIFERATION SCENARIOS

Continued Iraqi research on more capable missile systems leads to three likely proliferation scenarios that could occur after the lifting of the economic sanctions and the end of the UNSCOM inspections.¹³⁰ These breakout scenarios illustrate the three most likely and potentially dangerous situations with regard to Iraq's ballistic missile programs. Although speculative in that there is no *concrete* proof of their validity, these scenarios are based on the beliefs or 'gut feelings' of UN inspectors that have conducted inspections in Iraq since 1992.

1. Scenario One: Hidden Missile Systems

The first scenario deals with the discovery of missile systems that were buried or otherwise hidden in Iraq. Discovered as an Iraqi deception tactic, the burying of sensitive equipment has been of concern to UN inspectors since the end of the war.¹³¹ This tactic includes the concealing of complete missile systems, TELs, production equipment or any other technology that could lead to future Iraqi missile production. The sentiment among

¹³⁰ In a recent *Defense News* article, UNSCOM's financial problems could bring the end of the monitoring regime far sooner than anyone would have liked. If unable to continue inspections, Iraq could potentially rebuild its CBW programs within 12 months and a nuclear program within 5-8 years, sooner with outside assistance. Iraq could also, almost immediately, rebuild the missiles that the UN believes remain hidden. See: Philip Finnegan, "U.N. Woes May Allow Bio-Chem Revival in Iraq," *Defense News*, 11, no. 46 (November 18-24, 1996).

¹³¹ UNSCOM and the IAEA have found several sites where equipment has been intentionally hidden by Iraq. Items found were primarily nuclear and ballistic missile technology. These incidents illustrate the Iraqi desire to conceal its weapons and equipment for future use.

UN inspectors is that it would not be difficult for the Iraqis to hide missile equipment from the UN because of its size and topography.

The threat that this type of scenario would bring is that the Iraqis would have access to missiles, like the AL HUSSEIN or AL ABBAS, with a range greater than 300 kilometers. Perhaps worse than the Iraqi possession of long-range systems is the fear that they still possess the necessary manufacturing equipment to design, test or produce other systems with even greater capabilities.

The ultimate concern in this scenario would be the international reaction or response. Some interesting questions are raised. Specifically, would the United Nations have the confidence or conviction, in the form of international support, to go back and disarm Iraq? Could the United Nations peacefully dissuade Iraq to give up its WMD programs? Would the threat of continued economic sanctions dissuade Iraq from pursuing these weapons? If not, would the United States risk the almost certain negative international criticism to unilaterally disarm Iraq? Unable to be answered until faced with the problem, these questions could become central to further Iraqi proliferation.

2. Scenario Two: Future Iraqi Missile Purchases

The second potential scenario deals with a purchase of missile systems or technology from another country. Likely sources of missiles could be from Russia, who is a member of the MTCR, but continues to be suspected of transferring missile components to Iraq, China or one of the former Soviet states, who adhere to the agreement, yet continue to follow a policy of selective enforcement; or North Korea, who

agreement, yet continue to follow a policy of selective enforcement; or North Korea, who is neither a member nor an adherent, and is currently the nation that poses the most serious threat to the regime. Since the Gulf War, it has been suspected that Iraq has been attempting to tap into its network of sources of WMD technology. Success in this area could prove disastrous for missile nonproliferation. The United Nations has spent a tremendous amount of time and resources to uncover this procurement network, however, in 1995, Jordanian officials, acting with UN assistance, seized a shipment of missile components (approximately 115 Russian gyroscopes and accelerometers) enroute to Iraq. These components were used in Russian ICBMs and could be used in Iraqi missiles easily exceeding the range of 1,000 kilometers.¹³² The shipment originated in Russia, illustrating that the trade of missile technology still continues, even with states that are adherents to the agreement.

3. Scenario Three: Increased Iraqi Missile Development

The third potential scenario involves the continued Iraqi success with SA-2 technology. It is widely believed among UN missile inspectors that after the economic sanctions and UNSCOM inspections have been lifted, that Iraq will attempt to design intermediate- and long-range ballistic missiles. One possibility for achieving this could be by using multiple reverse engineered SA-2 engines. Success with this program could yield a missile with a range of 1,000 kilometers. Broken down into two differing

¹³² Alan George, "UN Uncovers Secret Iraqi Ballistic Missile Project," *Flight International*, January 3-9, 1996, and "UNSCOM Report to the United Nations Security Council," December 1995.

proliferation philosophies, the Iraqis could opt to attempt to design a large number of SAMOUD type missiles. This verticle proliferation would give the Iraqis a large number of missiles with limited capability.

Use of SA-2 technology could also take the form of horizontal proliferation, where the Iraqi's attempt to produce a small number of more capable missiles. Focusing on quality instead of quantity, the Iraqis could attempt to build a missile with increased payload, improved accuracy or an extended range. There appears to be some evidence, uncovered by the UN inspectors, that Iraq was working on some aspect of this design. There are three resulting systems that could be derived from this evidence. Although there is no evidence of detailed plans, Iraqi drawings have been found outlining a system utilizing four reverse-engineered SA-2 engines. Clustering four liquid rocket engines as the first stage has proven to be successful in India's PRITHVI missile, which has a range of 150 to 250 kilometers.

Another system that could be developed using current Iraqi missile technology would involve staging two short-range engines together. Utilizing some combination of a solid rocket engine, like that found in the AL ABABIL, and a liquid rocket engine, like that found in the SAMMOUD, either in a side-by-side or one on top of the other configuration. Staging a missile in this manner has been successful in the AGNI intermediate-range missile. The range of the AGNI missile is between 1,500 to 2,500 kilometers.

The third sytem that could result from this technology is combining both of the above systems to make an intermediate-range SSM. This potential two-stage system

would involve a clustered four engine turbo pump first stage and a clustered, single engine second stage. Although it appears that work on these projects has stopped due to close monitoring by the UN, it is feared that these programs could be revived in the future.

This fear over re-engineering SA-2 technology has led UNSCOM to attempt to tag all declared liquid rocket engines in Iraq's air defense SA-2s. By doing this, the UN will attempt to track all of the engines to ensure that these engines could not be covertly used in a SSM project. Continuation of the monitoring regime with this problem in mind provides a good chance that the UN can prevent such a missile from being produced, however, discontinuing the inspections and monitoring along with lifting the economic sanctions would seemingly give Iraq the 'green light' for advanced missile development.

D. CONCLUSION

Iraq's current missile capabilities do not pose a substantial threat to any of its neighbors. Iraq's technological capabilities to rebuild its missile programs are severely lacking, unless they have retained more missile technology, production equipment or complete systems than UN assessments believe. Their human capabilities to rebuild its missile programs exist although most experts would agree that outside assistance would be necessary for Iraq to develop a 1,000 kilometer-plus system. The ballistic missile threat from Iraq comes in the form of *retained technology* that has not been detected by UN inspectors or could be obtained in future transactions; *resources*, in the form of revenue from past and future oil sales; and *determination*, as was displayed during the

1980s in the form of weapons procurement (specifically WMD technology) and in the 1990s, in the form of aggression against its neighbors. Iraqi possession of long-range missiles poses a substantial threat to the stability of the region and to U.S. interests.

VII. CONCLUSIONS

The Iraq proliferation case illustrates many lessons which have already been exhaustively studied and others which require further study. This thesis has raised many interesting issues, including ideas on WMD proliferation and the ability to deter others with these weapons, the future of ballistic missile defense, tactics to defeat ballistic missiles, the role of the United Nations in these cases (specifically the UN Security Council), and the future role of counterproliferation efforts. The main points raised in this thesis are outlined in the following sections.

A. EXPORT CONTROLS

According to Kenneth Timmerman, "the current system of international export controls is in shambles."¹³³ Although changes were made in the early 1990s through the MTCR, the system is still insufficient to stop a determined proliferator from acquiring these weapons. This is in part because little is done to limit the supply of weapons technology, and even less is done to reduce the demand for these weapons.

The MTCR, which is designed to limit the supply of missile technology, will remain ineffective until a credible enforcement mechanism is inserted to punish regime violators. Perhaps this will be impossible until the missile regime is lifted to the same

¹³³ Kenneth Timmerman, *Death Lobby*, 88.

status as the Nuclear Nonproliferation Treaty. Unlikely to happen in the near future, the Missile Technology Control Regime will probably continue on its path of limited success.

While the supply of technology is addressed by the MTCR, the problem of managing export controls will not cease until the problem of demand is adequately addressed. In her chapter on missile exports, Kathleen Bailey stated: "Supply-side strategies will not prevent missile proliferation and, increasingly, they will not even slow it." Arms control treaties that limit or ban the production of ballistic missiles, security assurances and Confidence-and Security-Building Measures (CSBM) are all ways of addressing the demand for missiles and, until these issues are addressed, the demand for missiles and WMD will continue to drive supply.

B. MILITARY ASPECTS OF BALLISTIC MISSILE PROLIFERATION

An examination of the arming and disarming of Iraq illustrates many military or tactical lessons. The ability to hunt and destroy an adversary's ballistic missiles is essential to continued U.S. military superiority, however, the methods of destroying missiles is not the central theme of this thesis. The main findings within this area are:

1. The destruction of a nation's ballistic missile (and WMD) capabilities is a short-term solution to a longterm problem. Because of the diffusion of the technology, the weakness of the current regime, the willingness of suppliers and the dual-use nature of the technology, weapons of mass destruction, even among Third World nations, are here to stay. This fact also makes a strong case for the United States to have the ability to counter these weapons at any level.

2. The use or threatened use of missiles armed with WMD warheads poses a serious threat to the United States. For the time being, NBC weapons will serve as the stone that can defeat Goliath. Dealing with nations that possess these weapons, especially unstable (or seemingly irrational) Third World nations, will continue to pose delicate and potentially dangerous foreign policy situations for the United States.

Although Iraq's SCUDs failed to achieve their objective of drawing Israel into the war and destroying the Coalition, Coalition airpower also failed in its attempt to destroy the SCUD threat. The problems of finding mobile targets with airpower may prove very difficult to overcome.¹³⁴ First, the regional weather conditions and open, flat terrain in Iraq actually favored the hunters, unlike the continual overcast and rugged terrain, such that might be encountered in North Korea. Second, even a small increase in the number of launchers would require an exponential increase in airpower to suppress, much less destroy. Third, air forces of the future will be smaller, and a higher percentage of sorties for SCUD hunting will likely have a debilitating impact on the Air Force unless there is a revolutionary breakthrough in our ability to locate TELs.

C. THE MTCR

Even though the MTCR has enjoyed increasing popularity in the 1990s, there remain major avenues of missile proliferation that are not blocked by the existing regime, especially:

¹³⁴ Although not the primary focus of this study, the discovery of Iraqi chemical and biological ballistic missile warheads by UN inspectors greatly complicate the problem of missile proliferation and ballistic missile defense.

1. Countries attempting to purchase missiles from suppliers from outside the regime;
2. The vast amount of missile technology already dispersed throughout the Third World;
3. The continued transfer of technology in the form of trained personnel.

This thesis has addressed several problems with the MTCR that need to be corrected before it can be effective in preventing the spread of missile technology.

1. MTCR Membership

Although 28 nations are currently members of the regime, the MTCR continues to suffer from limited membership. Many of the recent additions to the regime have been largely symbolic, in that they do not have major missile or rocket industries. The greatest threat with regard to membership are the nations that could transfer complete systems. China, North Korea and the post-Soviet Commonwealth of Independent States are the most significant threat to the regime and their adherence to the regime's guidelines is imperative.

2. MTCR's Lack of Enforcement

Lacking formal treaty status, the MTCR continues to lack a legitimate method of enforcement. This thesis has displayed how nations interpret the guidelines of the regime in ways that suit their own interests. The most glaring example of this are France and Germany who reject the need for controls on launch and guidance systems to legitimate civilian space programs. This distinction between promoting trade and security interests has led member nations to disagree as to how the agreement is to be interpreted. The

MTCR needs verification mechanisms to attain the legitimacy required to successfully complete its goals. The inability to punish obvious regime violators is only compounded when members states fail to agree on its interpretation.

3. Tighter Technology Restrictions

The MTCR was designed to prevent the spread of nuclear capable missiles, but recently has had to adjust to other forms of WMD by reducing warhead size and range. Due to the dual-use nature throughout the entire realm of WMD, there must be continued adjustment to the categories of prohibited items. Recent developments have shown that large numbers of short-range missiles can be just as destabilizing as intermediate-range missiles and the MTCR must have the flexibility to adjust to this and similar trends that often occur in the proliferation of missiles.

D. THE INSPECTION AND VERIFICATION REGIME

The lessons pertaining to the United Nations involvement in the Iraq case are also many. Although only in its fifth year, the amount written on the lessons learned from the experiences of the UN Special Commission is tremendous and continues to grow. Iraq has proven to be a significant case for this study because of Iraq's ability and willingness to deceive inspectors and constantly challenge the United Nations. The Iraqi desert has also proven to be a great place to test the most modern and advanced U.S. and UN inspection and monitoring equipment. This ability to gather information on WMD activities in other countries will aid in preventing another Iraq before it happens.

Of the many documented lessons from this experience, the greatest is the need for international agreement, cooperation and support for these actions. The efforts of Desert Storm and UNSCOM probably would not have taken place had the international community not overwhelmingly agree to confront a hostile Iraq. The ability to counter nations like Iraq with overwhelming international influence is critical to preventing cases like Iraq before they happen and defeating them once they have happened.

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7. Professor Dana P. Eyre 1
Code NS/EY
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Naval Postgraduate School
Monterey, Ca. 93943-5000

8. **Jennifer Duncan** 5
 Code CC/JD
 Naval Postgraduate School
 Monterey, Ca. 93943-5000

9. **Professor Gordon McCormick** 1
 Code CC/MC
 Naval Postgraduate School
 Monterey, Ca. 93943-5000

10. **Professor James Wirtz** 2
 Code NS/WI
 Naval Postgraduate School
 Monterey, Ca. 93943-5000

11. **LT. Brian J. Talay** 1
 136 7th St.
 Pacific Grove, Ca. 93950

12. **Tess Miller, J.D.** 1
 4180 Sunridge Road
 Pebble Beach, Ca. 93953

13. **Wyn Bowen** 1
 Monterey Institute for International Studies
 425 Van Buren St.
 Monterey, Ca. 93940

14. **Commander Dave Morrison** 1
 Commanding Officer SEAL Team Two
 NAB Little Creek
 Norfolk, Va. 23251